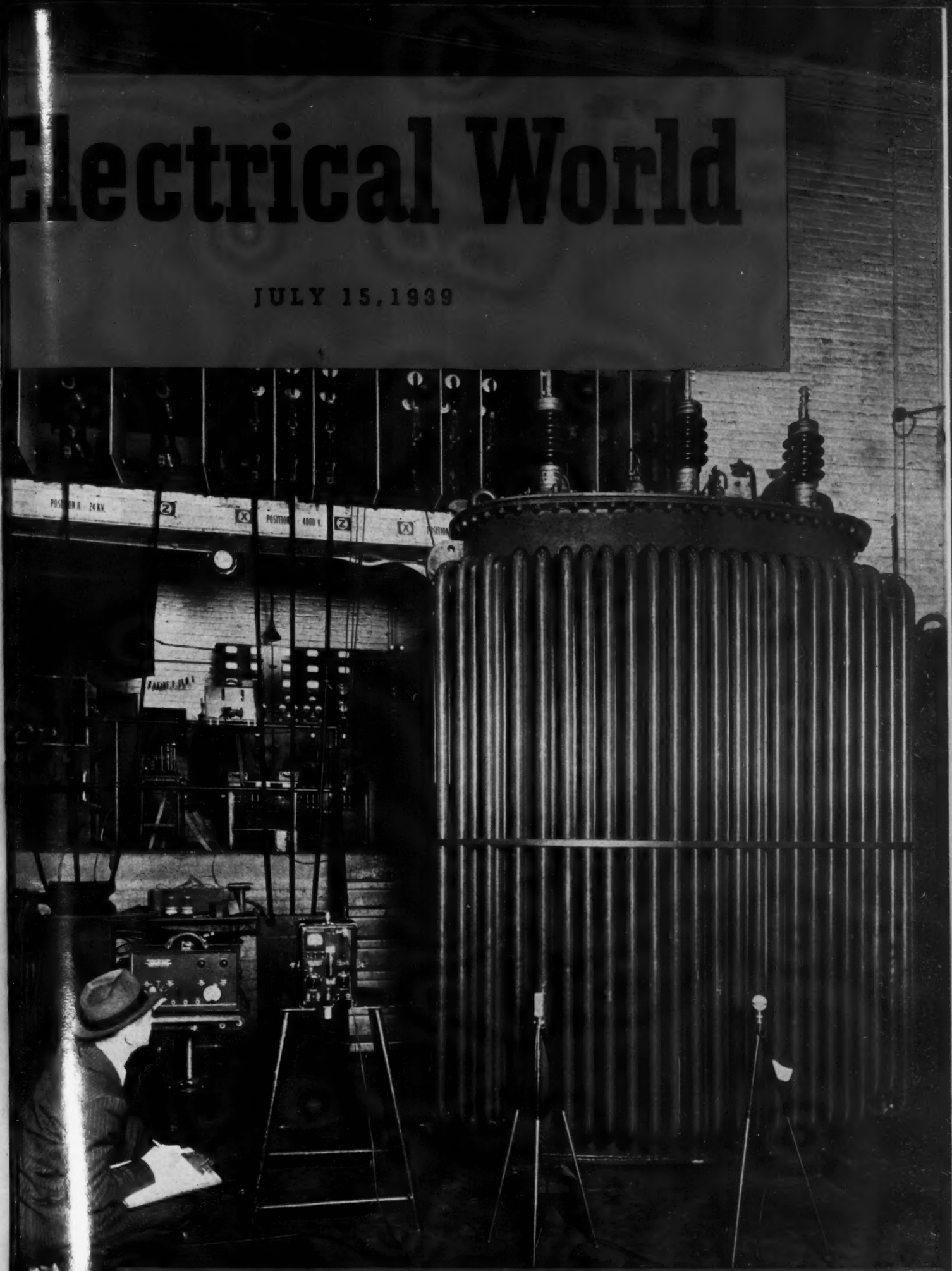
Electrical World

JULY 15, 1939



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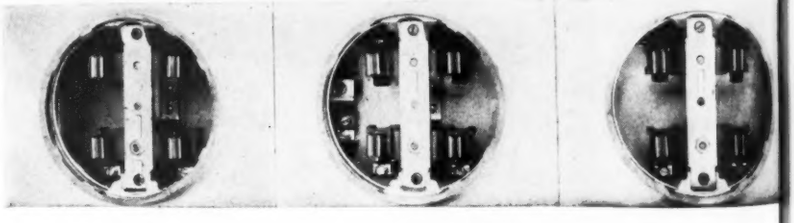

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Another Kind of Yardstick

On the stage of public power the scene now shifts from the Tennessee Valley in the Southeast to the Columbia River in the Northwest. For the time being, at least, the basic principles for the marketing of TVA energy have been established. For the sale of Columbia River power nothing has been determined.

There are two federal projects on the Columbia—Bonneville and Grand Coulee. The latter is under construction and when completed will be the largest hydro project in the world. At Bonneville, just a short way from Portland, Ore., two units totaling 86,400 kw. have been completed for more than a year, two 54,000-kw. units are on order and work on the power plant, to house still two more (six in all), is under way.

In spite of the arbitrary allocation of investment costs Bonneville power at present rates is not cheap power. It offers no economies to the private companies that might co-operate in the distribution of the energy. Therefore a new schedule of wholesale rates must be set up if any benefits are to be passed along to the consumers. The administrator has suggested a new schedule to the Federal Power Commission and there seems considerable likelihood that new rates will be announced shortly.

For more than a year now Bonneville has been ready to send out more than 80,000 kw. and it has been virtually idle. Cascade Locks, widely heralded as the first customer, isn't taking enough energy to warrant keeping the line hot. The only customer, therefore, is a power utility, Northwestern Electric, which is taking from 2,500 to 5,000 kw. and, since it doesn't need it, is passing it on to Portland General Electric. Something, therefore, must be done and done soon to dispose of this power.

Under the act at least 50 per cent of this power must be reserved for public agencies until 1941. Although a number of public utility districts (PUDS) have been formed, there has been almost no inclination on their part to go in debt through a bond issue to get this power. These districts were formed under the administration of the late J. D. Ross. Without the drive of an out-and-out public ownership administration at Bonneville there is little likelihood that the PUDS will take much energy.

The only avenue that offers any opportunity to market Bonneville power within a reasonable period of time is the private utility. And if it does it will mean the closing down of steam plants and the retiring of private interests for all construction of generating plants and transmission lines for many, many years, if not forever.

And if some co-operative arrangement can be worked out between the government and private capital it will still take some time before all of Bonneville power can find a market. Unlike some other sections of the country, the Northwest has virtually no unserved inhabitable areas. Moreover, the usage is high and the rates low. There is almost nothing, therefore, that can be done to extend service and no considerable additional usage can be expected for present customers through the enticement of greatly lowered rates. As to new industries, opinion seems to be divided, although it is reasonable to believe that a concerted effort on the part of all interests might bring new processing within the area. The difficulty here, of course, is one of transportation of raw materials and finished product as well as a supply of stable labor.

Perhaps another kind of yardstick, one that is a challenge to initiative, and not a bludgeon, is in the making in the Northwest.

New Protective Measures Stir A.I.E.E. Convention Interest

Hydrogen-cooled generators expanding — Sodium on cable lead beneficial — Efficacy of multi-winding transformers — Control of radio noise — Manufacturer discloses two new breakers — Wear on meter jewels at light load

THAT the old standbys—protection, cables, circuit breakers—are still churning out fresh problems was adequately demonstrated at the combined summer and Pacific Coast convention, A.I.E.E. For these were the subjects which drew the largest attendances at technical sessions and provoked the keenest discussions.

Three parallel sessions on three mornings covered nine general subjects, on which light was thrown by 43 technical papers and nearly a hundred prepared discussions which were presented during the course of the meetings.

More than 900 were in San Francisco for the meetings, of which number 478 were engineering members of the Institute who participated in the technical sessions. Less technical, but no less a real problem to the organization, is the problem of human relations, to which attention of the delegates was drawn by Dr. Adam S. Bennion in an address to the general convention.

So that ELECTRICAL WORLD's readers may digest the highlights of discussions which occupied a full working week, a resume of noteworthy papers follows. This presents abstracts of the principal points in the major papers, together with statements of the principal observations by the various discussers.

John C. Parker, president of the Institute, and L. T. Merwin, president, Northwestern Electric Company

Generation and Transmission

Mingled Hydro and Steam Power Production in California, Past, Present and Future—By **A. H. Markwart**, Pacific Gas & Electric Company

The agencies in southern California were allowed from six to nine years after signing their contracts in which to prepare to receive Colorado River power, consequently, notwithstanding the intervening depression and consequent lack of growth, they are absorbing it in an orderly manner. As to the future, southern California agencies, except for a limited hydro supply on Colorado River below Hoover Dam, generally will have to construct steam-electric plants to provide the capacity to meet growth of load. Northern California is more fortunate in that there are a number of hydro-electric projects which can be developed and which in combination with steam-electric plants will produce mingled power agreeable to the load on a competitive basis. With orderly power development resumed after absorption of Central Valley power an extensive program of hydro-electric construction is a reasonable expectation.

Use of Multi-Winding Transformers with Synchronous Condensers for System Voltage Regulation—By **H. P. St. Clair**, American Gas & Electric Service Corporation

From descriptions of actual installations on the American Gas & Electric Company system it is shown that three-winding and four-winding transformers properly designed have become a rather important tool for use in system planning. In any large interconnected network it is becoming increasingly necessary to operate to a large extent on a constant voltage level basis throughout the system. Special designs of three-winding and four-winding transformers have contributed very substantially to the solution of the problem of maintaining reasonably constant voltage levels on the 132-kv system under operating conditions that necessarily include the handling of large amounts of reactive current.

Wave Shape of 30- and 60-Phase Rectifier Groups—By **O. K. Marti**, Allis-Chalmers, and **T. A. Taylor**, Bell Telephone Laboratories, Inc.

Introduction of auto-transformers as phase shifters offers a very attractive means of reducing harmonic components which otherwise would be outstanding where multi-unit rectifiers are involved. This method of improving wave shape conditions has proved not only effective but also simpler and more economical than the application of filtering devices. The application of phase shifters is by no means limited to the present arrangement, but can be adapted to a variety of conditions.

Lightning Investigation on Transmission Lines—VIII—By **W. W. Lewis** and **C. M. Foust**, both of General Electric Company

All arrangements of counterpoise wires that have been tried have given improvement in the flashover performance of the lines, some arrangements more than others. The data show that counterpoises of various arrangements pick up from 40 to 80 per cent of the current, as compared with the tower footings which pick up from 60 to 20 per cent. Counterpoise resistance calculated from the division of current between counterpoise and tower footing agrees with the resistance measured by megger ground tester and current divides substantially in accordance with the resistance. In territory in which a considerable depth of sand lies on the surface, producing a very high resistance condition, driven rods offer a very effective means of reducing the tower resistance. Magnetic links have proved to be very valuable in obtaining the data on current necessary for the analysis of the counterpoise problem.

Discussion

E. E. George (Tenn. Electric Power) summed up Markwart's paper with the comment that "(it) brings out eloquently the disruption of planning that occurs when political objectives take the place of engineering." Treating available energy sources mathematically, L. A. Doggett (State College, Pa.) showed that coal reserves, estimated to last 4,000 years at present rate of consumption, will last only 400 years if consumption increases but 1 per cent per year. Hence,

he concluded, hydro should be put to work at once for maximum long-run economy.

As to multi-winding transformers, L. H. Hill (Allis-Chalmers) pointed out that four-winding units are not necessarily complicated, the main design problems being merely arrangement of windings and attaining space for bushing clearances and terminal boards. He showed pictures of new three-winding units with separate tap-changing-under-load equipments on two windings. Answering a question by Bradley Cozzens (L. A. Bureau of P. & L.) the author said relatively high reactances were specified in some of the cases described in order to attain independent regulation.

Discussing rectifiers, E. V. De Blieux (General Electric) saw little advantage in going to more than 36, perhaps 48, phases because higher harmonics have a small effect on telephone interference factor.

Protective Devices

High-Capacity Hydro-Blast Circuit Breaker for Central-Station Service—By **W. F. Skeats** and **W. R. Saylor**, General Electric Company

The increasing demand for oilless circuit breakers has resulted in a number of contributions in that field. Outstanding among these from the standpoint of interrupting capacity at generator voltages is the hydro-blast circuit breaker, which has been developed in ratings up to 1,500,000 kva. This breaker has the feature of complete interchangeability with the standard "H" type oil circuit breaker and thus combines all of the well-known advantages of that type with the total absence of inflammable material. Details the construction and operation of the 500,000-kva. hydro-blast circuit breaker for central-station service, several of which have been in service for more than half a year. The hydro-blast breaker has the same over-all dimensions as the oil circuit breaker, of which it is an outgrowth, substantially the same general arrangement, and the same performance characteristics, except that the presence of inflammable liquid has been entirely eliminated. The various interrupting problems introduced by the change from oil to water have been overcome, and six months' field experience has confirmed the practicability of the arrangement.

"Magne-Blast" Air Circuit Breaker for 5,000-Volt Service—By **E. W. Boehne** and **L. J. Linde**, General Electric Company

Fundamental principles of magnetic action and thermal reaction have been united in an original manner to create a new circuit interrupter, the "Magne-Blast" air circuit breaker. Intended for general applications in switching, controlling and protecting 2,300 to 5,000-volt circuits, this breaker, throughout a comprehensive test program, has proved satisfactory in every requirement." The "Magne-Blast" air circuit breaker, by cooling and lengthening the arc ian interleaving chute, adds resistance to the circuit as the arc is extinguished. Rates of rise of recovery voltage are held to a harmless value.

Transient and Steady-State Performance of Potential Devices—By **E. L. Harder, P. O. Langguth** and **C. A. Woods, Jr.**, Westinghouse

General method presented utilizing an equivalent circuit for analyzing the performance of potential devices from a design and application standpoint, a method which offers an advantageous point of view for visualizing the phenomena involved as well as providing the specific solutions. The studies afforded a basis for design of a new capacitor potential device utilizing a variable reactance transformer and having windings for supplying simultaneously star- and delta-connected phase burdens and residual burdens.

Testing of Distribution Arresters—By **Herman Halperin**, Commonwealth Edison Company

Questionnaire was sent in January, 1939, to 55 operating companies. Replies were received from 52 companies. Twenty-nine companies reported that tests of various types are an established procedure for distribution arresters, with only six of the companies testing new arresters. The 29 companies have been making tests on used arresters for periods ranging from one to eleven years, except that one company has been making 60-cycle withstand tests on removed arresters for 24 years. More than 150,000 arresters removed from service due to causes other than trouble associated with the arresters themselves have been tested by the 29 companies.

Sensitive Ground Protection for Radial Distribution Feeders—By **Lloyd F. Hunt** and **J. H. Vivian**, Southern California Edison Company.

Scheme responds to weak ground fault currents with means provided to limit maximum ground currents under conditions approaching short circuit. Capacitors in conjunction with voltage relay used for four-wire. Three-wire scheme uses over-current directional ground relay. Several additional installations being made.

12-Kv. Metal-Inclosed Bus and Switch Structure Station "C," Oakland Pacific Gas & Electric Company—By **F. S. Benson**, Pacific Gas & Electric Company, and **H. E. Strang**, General Electric Company.

Discusses reasons for decisions and cites the objectives attained. Factory design and fabrication advantageous. Minimum of drafting and specifications. Minimum delay in building erection. Equipment self-supporting. Everything fireproof and ratproof. All live parts totally inclosed.

Discussion

Considerable interest was shown in the hydro-blast breaker. B. P. Baker (Westinghouse) submitted a paper stating his company had acquired patent rights to a water breaker in 1922 but did not consider them best suited to American requirements. He agreed

R. W. Sorensen, California Institute of Technology

the effect of water on the various materials may not be serious, but questioned the effect of the materials on water, i.e., how interrupting duty and time affect water conductivity. A. C. Schwager (Pacific Electric Mfg.) asked if the steam tended to impede contact movement. E. Van S. Sayles, speaking for J. A. Elzi (Commonwealth & Southern), said such equipment would introduce problems of keeping water from freezing and maintaining purity.

H. A. P. Langstaff (West Penn Power) detailed considerable experience with potential devices on his company's 132-kv. system, beginning in 1928. Early difficulties, he said, were due almost entirely to faults originating in lead-in cables. Operation, though subsequently entirely satisfactory, has not included some of the problems raised in the paper, as it has not been with impedance-type or high-speed relays.

In testing distribution arresters, said E. J. Allen (General Electric), the "Operating Duty Test" set forth in A.I.E.E. Standards No. 28 most nearly approaches actual service conditions. Such test on 3-kv. arresters with 4 kv. applied may damage arresters. He outlined the specific limitations of the various other test methods, concluding that simpler tests, yielding only partial data, should not be taken as cause for arrester rejection.

Many discussers enthused about the protection scheme described by Hunt and Vivian. M. A. Sawyer (So. Cal. Telephone Co.) said the system introduces protection through the high impedances of the grounding transformers as well as by fast de-energizing and was considered highly desirable

Homer and Paul Churchill, both of Line Material Company.

on jointly occupied poles. L. F. Kennedy (General Electric) inquired about circuit constants, but F. C. Lindvall (Cal. Tech.) said tests indicate these have negligible effect on the initial breakdown of energized conductors lying on soils generally encountered in the West.

At a special group meeting on sensitive ground protection, Hunt and Vivian said they are now working on a relay scheme for application to loop service.

Electrical Machinery

Hydrogen-Cooled Turbine Generator — By **D. S. Snell**, General Electric Company

Reduction of the windage and ventilation losses of a turbine generator with hydrogen cooling increases the full load efficiency about 0.7 per cent for 1,800-r.p.m. machines and about 0.9 per cent for 3,600 r.p.m. machines. Estimated net yearly savings with hydrogen cooling for different sizes of generators, corresponding to these increases in efficiency, are shown to range from about $4,000 a year for a 25,000-kw., 3,600-r.p.m. unit to about $20,000 a year for a 160,000-kw., 1,800-r.p.m. unit. The greater output per pound of material obtained with hydrogen cooling extends the limit of output of generators of the 3,600-r.p.m. type and allows the building of generators with self-ventilation in capacities which, if built for air cooling, would require external fans. The largest capacity at 3,600 r.p.m. now considered practicable with air cooling is about 62,500 kva., and such a machine would have external fans; with hydrogen cooling, generators as large as 81,250 kva. at 3,600 r.p.m. are practicable, ventilated with internal fans. At present no hydrogen-cooled generators smaller than 28,125 kva. at 3,600 r.p.m. or smaller than 81,250 kva. at 1,800 r.p.m. have been built, or are under construction, by the General Electric Company. For sizes appreciably smaller than these the gains with hydrogen cooling do not at present appear sufficient to justify the additional expense and complication involved in its use. For the larger sizes, that is, above about 37,500 kva. at 3,600 r.p.m. and 75,000 kva. at 1,800 r.p.m.—it is probable that practically all future generators will be hydrogen cooled.

Hydrogen-Cooled Turbine Generators—By **M. D. Ross** and **C. C. Sterrett**, Westinghouse

With operating experience on a number of units and over a considerable period of time at hand, the initial stage of development of hydrogen-cooled generators is passed. There will no doubt be minor difficulties to correct as time goes on, but these will be of no more serious nature than are to be found in air-cooled generators. It will also be possible to simplify considerably the generator and its attendant parts in future machines as greater experience is gained with this type of machine. Cost of supplying hydrogen gas is very low, and it has been the experience in most stations that the additional attention on the part of the operators as compared to that for an air-cooled machine is very small. With further experience, it will no doubt soon be possible to build 100,000-kva., 80 per cent power factor at 3,600 r.p.m. with this method of cooling.

Some Factors in the Mechanical Design of High-Speed Turbo-generators—By **S. H. Mortensen**, Allis-Chalmers, and **James J. Ryan**, University of Michigan

The paper indicates: (1) The practicability of analytically predetermined critical speeds of rotors with cross-sections having different moments of inertia at right angles; (2) the value of the photo-elastic method for stress determination in rotating bodies, and (3) the possibility of increasing machine efficiencies by control of bearing lubrication. In the recent development of large machines more efficient and stronger structures have been realized and the door opened for the construction of larger and more efficient generators.

Special Problems of Two-Pole Turbine-Generators—By **C. M. Laffoon** and **B. A. Rose**, Westinghouse

Double-frequency rotor vibration due to different rigidity constants for the two major axes in two-pole, 60-cycle generators can be eliminated by equalizing the rigidity constants on the two axes. This can be accomplished without introducing any reduction in flux capacity by machining narrow transverse slots in the body of the poles. The double-frequency vibratory forces inherent in two-pole generator stators cannot be eliminated. It is further believed that acceptable results cannot be economically obtained by reducing the air gap magnetic densities and increasing the rigidity of the stator core over that normally obtained when magnetic conditions are adequately considered to be harmful; consequently, the most practical solution is to isolate the stator core by means of flexible supports and thus materially reduce the magnitude of the disturbing forces transmitted to the stator frame, foundation supports and associated apparatus.

Discussion

So far, 2,500,000 kva. of hydrogen-cooled generators have been produced, said C. M. Laffoon (Westinghouse). E. H. Freiburghouse (General Electric) said such will be essential to the future high-speed machines. Operating experience is already yielding such refinements as end connections for easier cleaning of water tubes, replacing solenoid valves with diaphragm type, more accessibility through better shaft sealing. C. F. Hill and L. J. Barberick (Westinghouse) said moisture problems will be eliminated. Sterling Beckwith (Allis-Chalmers) and others pointed to possibilities for simplifying the units and their hydrogen auxiliaries.

H. D. Taylor (General Electric) said vertical resonance of shafts appears slightly below the calculated critical speed; horizontal resonance considerably lower. Large, high-speed rotors are so heavy that relatively greater reduction of first critical below calculated value is common experience. He agreed it should be practical to operate large generators above the second critical speed.

As to two-pole-machine design, H. D. Taylor (General Electric) said many cases showed structures in turbine rooms, responsive to 120-cycle stimulation, made more noise than the machines themselves.

Instruments and Measurements

Anomalous Behavior of the Moving Systems of Single-Phase A.C. Watt-Hour Meters at No Load—By F. C. Holtz, Sangamo Electric Company

Investigation reveals the moving systems of induction watt-hour meters to be in a peculiar state of motion under the condition of potential excitation only. Simple explanation offered for its origin and a method provided for recording and determining the actual value of the motion in various parts of the moving system. Interesting conclusions may be drawn from the investigation which throw much light on the problem of meter-bearing performance. The motion of the disk when supported by a ball bearing is similar to that which takes place with a pivot bearing, but of considerably greater magnitude. The motion can be reduced by (a) not having the electromagnet too near the edge of the disk and (b) keeping the active area of the permanent magnets as near together as possible and of equal strength. The motion of the meter pivot under no-load condition is in the form of a figure 8 and the total travel as taken from the curves is approximately 0.002 in. per cycle or 0.12 in. per second.

Some Practical Measuring Devices—By **Lloyd F. Hunt**, Southern California Edison Company, Ltd.

One of the most important facts not shown on the oscillograms is the actual position of the crosshead during any position of the oil switch stroke. A simple recording transmitting device was made to use in conjunction with the oscillograph to make an accurate record of this stroke. An-

other interesting circuit used on the oscillograph was that of recording trip coil voltage and current. A very sensitive a.c. instrument, a 0 to 100 microampere meter with an adjusting rheostat of 15,000 ohms shunted across the ground insulator of a string, makes a good hot line indicator, but the indication will vary with the humidity of the air. A disturbance recorder consists of a high-speed device that has a motor running continuously and engages the paper drive by means of a clutch operated by fault detecting and relays. At the same instant a spark coil is energized to puncture the paper and give the trace of the measuring device.

Carrier-Current Losses Measured and Interference Minimized on Boulder-Los Angeles Transmission Lines—By **J. D. Laughlin**, Bureau of Power and Light, Los Angeles, and **W. E. Pakala** and **M. E. Reagan**, Westinghouse

Two unusual facts were disclosed during the field testing of the supervisory control carrier-current channel on the 287-kv. Boulder Dam-Los Angeles transmission lines. Carrier-current losses were much higher than calculations and previous experience had indicated. The interference from power equipment arcs could not be isolated by the use of resonant choke coils, requiring special circuit designs for satisfactory operation. To overcome line noise, the minimum power received for satisfactory operation at any point should be 10 milliwatts above line noise level. High-frequency losses over the 287-kv. Boulder-Los Angeles power lines measured approximately five times those calculated, using the present accepted methods for such calculations. Previously reported tests gave a maximum of approximately 2.5 times. It is apparent that changes in the present working formula will be necessary.

Discussion

Importance of the Holtz paper was characterized by O. A. Knopp (Pacific G. & E.) as demonstrating that wear on jewel bearing is greatest at no load. He pointed out that more factual information on side thrust is needed.

Research on Cables

A New Technique for Lead Cable Sheathing—By **B. B. Reinitz** and **R. J. Wiseman**, Okonite Company

Combination of new standpipe method of filling and stabilization of the lead leads to following primary advantages: (1) All types of deleterious impurities are removed in process of treating commercial lead with sodium within the critical range of 0.005 to 0.05 per cent sodium. Such treated lead will retain approximately 0.001 per cent residual sodium, which has a stabilizing effect, when such metal is remelted, processed and used in service. (2) With proper lead press procedure, cable sheaths extruded from treated lead disclose a bright appearance, a distinct, uniform and brilliant crystal structure, absence of flow lines, inclusions and other commonly known defects. (3) Alloys prepared from treated lead are homogeneous and stable; moreover, the tendency toward segregation is reduced and thus greater resistance to corrosion is brought about. (4) A stabilized cable sheath has been developed whose metal can be remelted and maintained at elevated temperatures, such as 900 deg. F., in an open pot for long periods of time without drossing or affecting its chemical or physical characteristics.

Discussion

Some felt the paper implied that cable manufacturers are purchasing a poorer grade of lead than they actually are. G. E. Research Laboratories and D. M. Simmons (General Cable) both emphasized the high quality of lead commercially available. O. R. Grant (General Cable) presenting a discussion by I. G. Fawcett, characterized the method as introducing one impurity to offset another and believed the advantages claimed are within the range of experimental error.

Radio Noise

Instruments and Methods of Measuring Radio Noise—By **C. V. Aggers**, Westinghouse; **Dudley E. Foster**, Radio Corporation of America, and **C. S. Young**, Pennsylvania Power & Light Company

Embodies the relevant agreed recommendations of the joint co-ordination committee on radio reception of E.E.I., N.E.M.A. and R.M.A. as to the nature, essential characteristics and performance of an instrument for the measurement of radio noise voltages. It further gives detailed descriptions of the recommended practices for measuring radio noise directly from low- and high-voltage apparatus, for making noise measurements along overhead lines, for determining broadcast field strength levels and methods of collecting data for the establishment of radio noise standards.

Methods of Controlling Radio Interference—By **C. V. Aggers**, Westinghouse

Summarizes the recognized methods for reducing at the source man-made radio noises. Effectiveness of the different controlling methods is discussed in the light of efficiency and utility. Use of shunt type filters and choke coils is so broad that this paper is confined to the more important applications of these controlling devices. Filter methods are so important that specific applications are discussed in detail.

Discussion

Increased broadcast station capacity with resultant increase in signal strength was advocated as being more economical than line reconstruction in eliminating radio interference.

Miller (Ohio Brass) questioned the use of choke coils on transmission lines since these can be tuned to only one frequency band and thus fail to provide noise elimination for the increasingly popular all-wave receivers. Television was predicted to bring new problems, solutions being not yet apparent.

Industrial Power

Capacitor Relay Timing in Industrial Control—By **Carroll Stansbury** and **Theo B. Jochem**, Cutler-Hammer, Inc.

Capacitor timers have presented many difficult problems only recently overcome in such a manner as to make their use entirely practical. Recent improvements in electrolytic capacitors, particularly those of the etched-plate and fabricated plate types, have aided in solving such problems. It has been found possible to simplify the condenser-resistor idea by the employment of condensers of much larger capacity (on the order of 25 mfd.) making possible the elimination of the amplifying tube. Also, to meet the need for multiple timing, relays have been developed which provide two or more independently adjustable time periods with a single magnetic structure.

Variable-Voltage Equipment for Rotary Drilling Jigs—By **E. H. Lamberger**, Westinghouse

Tells why variable voltage equipment should be considered for oil-well drilling rigs, explains the operating characteristics of a typical equipment and compares the over-all performance with that of an equivalent mechanical drive as follows: (1) Engine clutch manipulation in connection with load pick-up is eliminated. (2) The engine cannot be overloaded or stalled. (3) Loads are picked up smoothly. (4) A wide range of motor speeds and torques is available. (5) Operating records are easily obtained. (6) Equipment may be located to best advantage.

Discussion

Commenting on oil field electrification, P. L. Savage (General Electric) substantiated statements as to low maintenance costs for variable-voltage, d.c. equipment. Maintenance has been negligible on two such rigs operating in a major California field since 1931, he said.

Frank Angle, Allis-Chalmers Manufacturing Company.

F.P.C. Chairman States Attitude Toward Power Industry

In answer to the "Electrical World's" question, Chairman Clyde L. Seavey states that the Federal Power Commission is as much concerned in and responsible for utility stability and integrity as owners and management

THE Federal Power Commission has the authority to gather statistics and data directly from the electric utility industry for the purpose of carrying out its duties as a regulatory body. To use such data in a manner inimical to the industry furnishing them does not seem consistent with the American conception of fair play. Press releases from the commission have of late been so pronounced in their pro-public ownership flavor that the editor of "Electrical World" asked Chairman Seavey to state officially the attitude of the commission toward privately owned electric utilities. For the record, we offer Mr. Seavey's reply, which follows. There can be no serious disagreement with the policy as stated if it is carried out in spirit as well as in letter.—Editor.

June 6, 1939.

The Editor
ELECTRICAL WORLD
New York, N. Y.

You have requested a statement from me as to the present and future attitude of the Federal Power Commission toward the electric industry.

There has been and still is a question in my mind whether it is not better to let the daily routine and expressed formal actions of the commission answer your query. It is the continuing policy of the commission to avoid trial of any issue by publicity before a public record of the facts has been established upon which proper findings and determination may be made. This commission, however, can only control itself in conformity with this policy, and because of that, the commission frequently is placed on trial in the public mind by misstatement, insinuations and guesses as to its policies, without opportunity first of having the underlying facts established. It is perhaps because of these statements that you have made your request.

The attitude and action of the commission is predicated upon and governed by the Federal Power Act of 1935, which provides for the licensing of water-power projects on the lands and in the waters under federal control, and seeks to regulate the transmission and sale of electric power in interstate commerce. The requirements of that act as to regulation of interstate commerce are similar to those of other federal and state statutory control over public utility businesses. They have been found both by courts and practice to be the reasonable exercise of the police power of the government in the public interest.

To supplement the provisions of the law, this commission has prescribed rules and regulations of practice and procedure which are substantially the same as those adopted and used for years by other regulatory bodies and which have either been sustained as reasonable by courts or have been accepted as such by the industry. The same is equally true regarding its orders as to accounting and other practices as well as to the calling for financial and operating reports necessary to adequate supervision under the law.

The commission has made special effort to eliminate all duplication of other federal and state agency requirements and unnecessary presentation of data in order to reduce to a minimum the expenses thereof to the industry. And for the same reason many matters are set down for hearing in the field rather than at the Washington headquarters, when this will accomplish a saving and a more equitable distribution of the costs.

The primary purpose of Part II of the Federal Power Act may safely be stated as the supplementation of state regulatory functions by complementary use of the theretofore unoccupied field of federal control.

The new functions provided for in 1935 include these principal powers and duties:

(a) Prescription of reasonable rates.
(b) Prescription of reasonable accounting practices.
(c) Limited control over security financing.
(d) Limited control over disposition of property.
(e) Limited control over mergers and co-ordination of facilities.
(f) Control over interlocking directorates.
(g) Control over service.
(h) The gathering and publication of electric power statistics.

The above regulatory powers and duties apply only to privately owned interstate utilities. The gathering of statistics includes the whole field of power.

The commission is concerned under the law only with the regulation of private utility property and it has and will confine its activities strictly to its legal functions. It conceives its duties as those of a representative for the public, consisting principally of those who consume the utility product and those who invest in utility securities. The commission proceeds upon the theory that it is as much concerned in and responsible for the stability and integrity of the utility as is the utility owner and management, or otherwise the public interest would not be properly attended.

This responsibility, however, is not one-sided. The obligations upon the part of the industry to observe the provisions of the law in the public interest are as impelling as those upon the regulatory body. This the commission must insist upon. This it desires to do in a spirit of co-operation so long as that co-operation does not infringe upon the public interest and interfere with the intent of the law.

The commission deals primarily with the operating company and its local management. In the vast ma-

[*Continued on page 48*]

New Refinery Has New Uses for Electric Service

Richfield unit employs approximately 10,000 hp. in electric drives — Reactors cut down the required interrupting capacity — New type explosion-proof motors are filled with carbon dioxide under pressure

R. E. JOHNSON, *Sales Engineer, General Electric Co., Los Angeles, Calif.*

ELECTRICITY and modern electrical equipment are playing an important part in the new refinery unit of the Richfield Oil Corporation at Watson, near Los Angeles, Calif. This expansion program entailed an authorized expenditure of more than $5,000,000 in 1937, and the plant was completed about September of 1938 by the contractor, C. F. Braun & Co. of Alhambra, Calif. A resulting capacity of 50,000 bbls. per day of charging stock is made possible largely by electrically driven or controlled equipment.

An engineering study of electric motors, steam turbines and reciprocating engines resulted in a decision to make general use of electricity. An estimated load of 10,000 hp. in the new unit, compared to an existing electrical capacity of approximately 4,000 hp. in the old refinery setup, meant considerable expansion of the electrical service. On the other hand, steam prime movers would require a new boiler plant. Safety considerations when operating in prevalent explosive gases, and higher costs, ruled out reciprocating engines.

The largest individual drives in the new unit were two main charging pumps, each requiring 1,000 hp. Estimating figures revealed that these could be provided with motor drives for about $40,000 less than for steam drives. Taking into consideration the cost of a new boiler plant, the extra space required by steam equipment and the lower maintenance cost of electrical equipment, electrical drives were favored. An excellent record and facilities for continuity of service by the Southern California Edison Co., together with an available power rate of less than 6 mills per killowatt hour, clinched the decision to use electric motor drives wherever possible.

In the majority of cases constant-speed, squirrel-cage induction motors or synchronous motors were well suited for pump, fan and compressor drives. Most of the motor drives were in hazardous gas areas and were required in Class 1, Group D explosion-proof, totally inclosed, fan-cooled

Fig. 1—Combination unit-switchboard room; circuit breakers are at the far end; above, right, is the inclosed, 2,300-volt bus

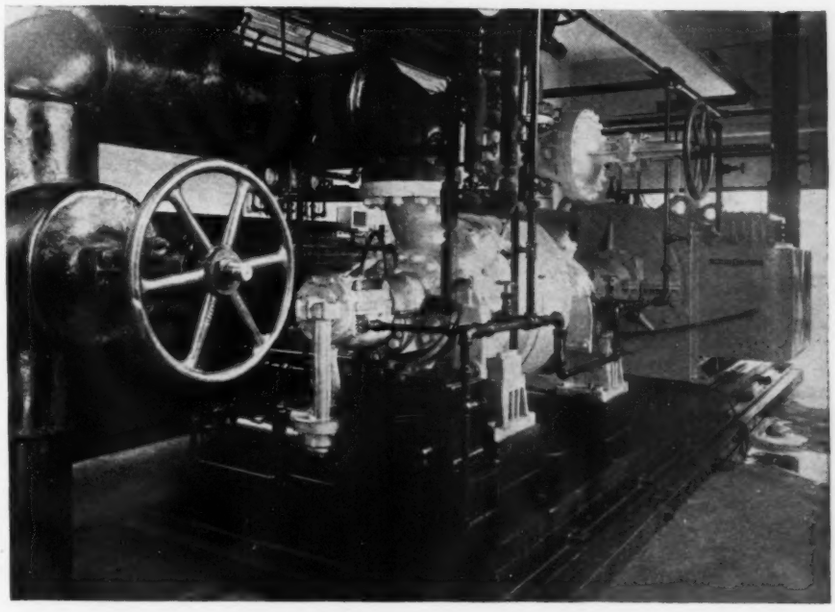

Fig. 2—One of the 1,000-hp., 3,000-r.p.m. motors, direct connected to a 1,000-hp. hot-oil charging pump

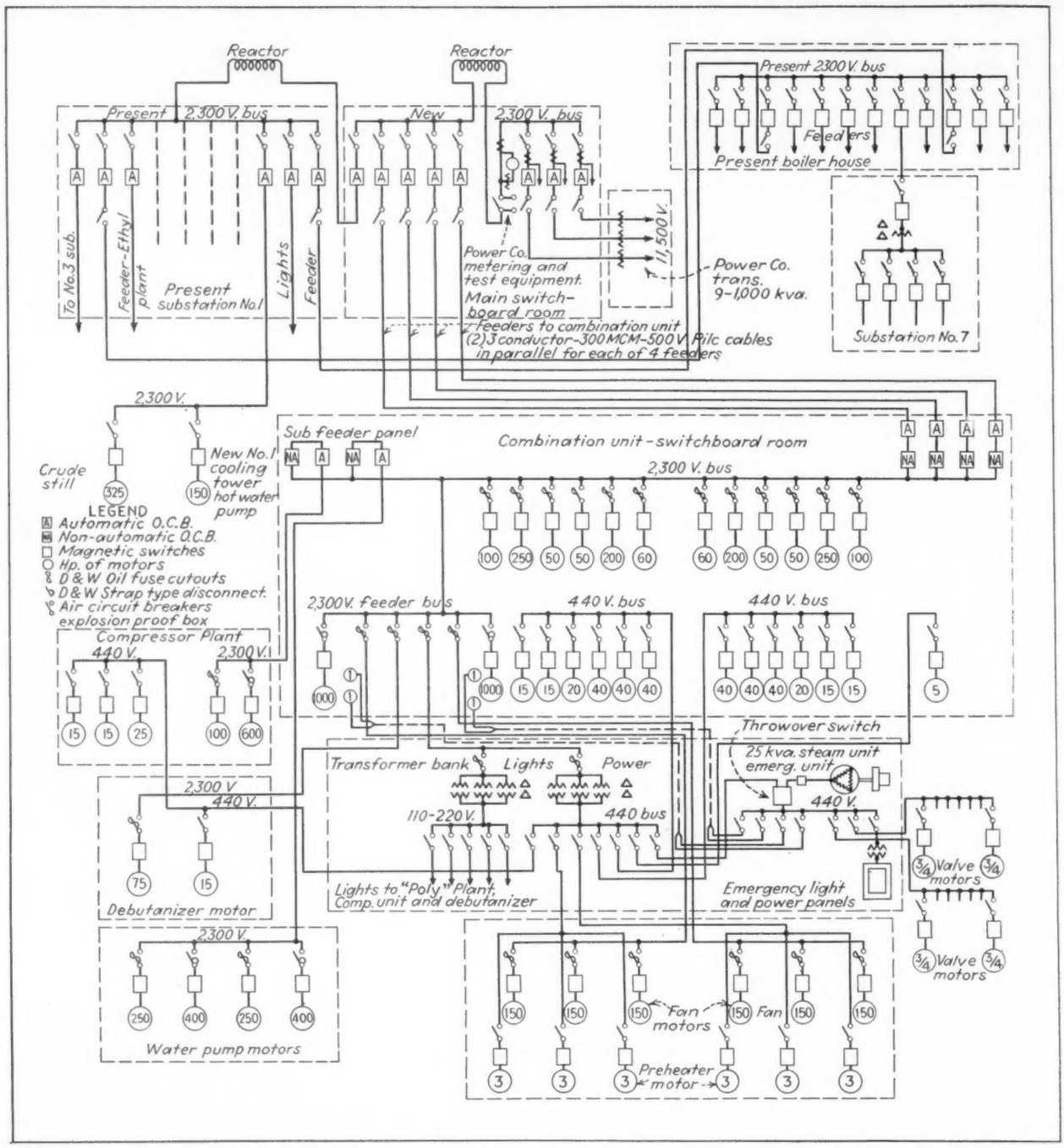

Fig. 3—One-line diagram of services for the refinery addition

construction. Exceptions were induction and synchronous motors for water pumps, compressors and fans located outside the hazardous areas. Centrifugal pumps, of primary importance in continuity of the refining processes, were duplicated, the standby units being equipped with steam turbines. The exceptions to this were the two 1,000-hp. hot oil charging pumps, each having a double shaft extension with a 1,000-hp. induction motor on one and a steam turbine on the other end of each pump.

Each of these two particular standby turbines has its governor set to take the load from the motor at approximately 2,800 r.p.m. This arrangement allows the unit to slow down gradually at reduced capacity, or, if desired, to bring the pump up to speed slowly, as well as serving as a standby drive.

Electric Power Service

Power at 11,500 volts, three phase, 50 cycles was brought in by the Southern California Edison Co., serving the new main switchboard room at 2,300 volts through nine 1,000-kva., single-phase transformers arranged in three parallel banks of three transformers each. The utility assures continuity of service by two independent feeders, each of sufficient capacity to carry the entire refinery load, with automatic throwover on 11,500 volts in case of power interruption on either feeder.

This power service carried with it a short-circuit interrupting capacity of 66,200 kva., handled by three heavy oil circuit breakers to the metering bus. Beyond that point the

relatively high cost of high-interrupting capacity circuit breakers and control equipment made reactor installations an attractive possibility. A study disclosed that a saving of thousands of dollars could be effected by installing a bank of 9 per cent outdoor-type reactors in the new 2,300-volt bus, bringing the interrupting rating down to 40,000 kva. for service to the new refinery unit. A further reduction of interrupting capacity to a value of 15,000 kva. was accomplished by a second bank of outdoor-type reactors to serve power to the older existing substation No. 1. This second reactor made it possible to retain the existing electrical equipment in the older part of the refinery without change.

These reactor installations are indicative of the care exercised by the engineers in providing a high degree of safety for both equipment and personnel and an over-all saving of thousands of dollars. Such an installation is unique among refineries and large industrials in this area.

Power Service to New Refinery

The utility's transformer bank and the substations outlined previously are all located in a non-hazardous area approximately 1,200 ft. from the general vicinity of the new refinery. Primary power at 2,300 volts, three phase, 50 cycles is brought from the main switchboard room through four feeder circuits to the combination unit-switchboard room. Protection is afforded these feeder circuits by induction overcurrent and reverse power relays.

Each feeder is comprised of two three - conductor, 300,000 - circ.mil, 5,000-volt, paper-insulated, lead-covered cables protected by a clay duct, buried in three inches of concrete. In a refinery pipe lines are constantly being replaced, moved or installed, and the concrete protection on the duct provides warning to pipe-line ditch diggers in such cases. Clay duct also resists the highly corrosive influences prevalent in refineries.

The total current per phase on all four feeders is approximately 1,360 amp; each of the four feeders has sufficient capacity so that any three of the four feeders can safely carry full rated load in case of failure of the fourth.

Since the combination unit-switchboard room is within the hazardous area, the four feeders each terminate in a pair of 600-amp. oil circuit breakers in series. One breaker of each pair is provided with automatic trip and has 50,000 kva. interrupting capacity, while the second serves only as a manually operated disconnect switch.

The four-panel switchboard at the right far end of the room (Fig. 1) contains the circuit breakers terminating the four feeders from the main switchboard room.

It consists of three ¼x3-in. copper buses per phase, supported by ceiling-mounted insulators, and is completely inclosed by transite panels. Requirements of accessibility, ease of installation and low installation cost, made this arrangement preferable to conduit and cable. Power is tapped off this bus for twelve motors, ranging in size from 50 to 250 hp., through General Electric Co. group-operated D&W oil fuse cutouts equipped with reactive links having 40,000-kva. interrupting capacity. These cutouts, placed ahead of the individual motor starters, provide oil-immersed disconnecting facilities as well as ability to interrupt short circuits in from ½ to 1½ cycles. These starters are General Electric oil-immersed construction with all contacts and connections at least 6 in. under oil.

Power service to the two 1,000-hp. induction motors also goes through D&W cutouts, but these are provided with copper straps instead of fuses, providing oil-immersed disconnecting facilities.

Note in Fig. 1 the neat panels which cover the front of the D&W cutout assemblies to line up with the starters. From the cutouts, General Electric full-voltage magnetic starters take power to the motors. These starters have 50,000-kva. interrupting capacity and, in addition to providing their own short-circuited protection, provide overload and under-voltage protection for the motor. The contactor is a 3-pole latched-in device with double-break, butt-type contacts, and the oil blast principle of arc interruption is one of the main features contributing to the relatively high interrupting rating. Short-circuit protection is provided by three series, magnetic, instantaneous over-current trips that act directly on the contactor latch. Over-load protection is provided by two induction thermal oil-immersed relays, as are all the other oil-immersed type General Electric starters used at this new refinery.

Practically all motors are controlled by means of explosion-proof "start" and "stop" push button stations located at the respective motors.

At the end of the inclosed bus two feeders go outside the hazardous area to water pump motors and the compressor plant through oil circuit breaker panels similar to the four connected to opposite end of the bus.

Other feeders, equipped with D&W cutouts of 40,000-kva. interrupting capacity, distribute 2,300-volt power to the synchronous motors driving fans, a transformer bank providing 440-volt, three - phase power for motors under 50 hp. and to another transformer bank providing power for lights and auxiliary control.

From the transformer bank supplying 440 volts a feeder brings power to explosion-proof controls shown on the left side foreground of Fig. 1. Crouse-Hinds explosion-proof fittings containing circuit breakers feed power to General Elec-

Fig. 4—Explosion-proof motors, ranging from 25 to 250 hp., in one of the pumping rooms

tric oil-immersed, explosion-proof, full-voltage magnetic starters.

New Type 1,000-Hp. Motors

An outstanding electrical development for this new refinery is the pair of "inert-gas-filled" induction motors provided by General Electric Co. for the two hot-oil charging pumps. These drives are located in a hazardous gas area, and with the largest available rating of totally inclosed fan-cooled, explosion-proof induction motors being approximately 400-hp., two-pole, 2,300-volt, three-phase 50-cycle, other alternatives were imperative. Base ventilated motors having a duct system for bringing in pure air for motor ventilation were considered, but the General Electric proposal of totally inclosed inert-gas-filled motors solved the problem more simply and economically.

One of these motors (in the background, Fig. 2) is direct-connected to the Ingersoll-Rand hot-oil charging pump. On each side of the motor is mounted, as an integral part, a surface air cooler, the interior of which forms a part of the closed system of ventilation. The interior of the motor and coolers is filled with carbon dioxide at a pressure slightly above atmospheric, maintained by commercial cylinders of the gas through pressure regulating valves. Gas consumption is low, requiring only one 50-lb. cylinder of carbon dioxide about every two weeks of operation, due largely to the positive seals at the motor shaft.

Cooling water at 75 to 80 deg. F., circulated through the surface cooler, removes the heat transferred to the cooler by the carbon dioxide. The non-inflammable carbon dioxide is circulated axially through the stator slots and ventilating passages by a system of internal fans and deflectors and is maintained at a temperature of approximately 40 deg. C. by the surface cooler.

Positive pressure lubrication to the insulated-type, spherical-seat sleeve bearings of each motor is provided by two motor-driven oil pumps, the oil supplying both lubrication and a seal against escape of the carbon dioxide gas. Oil from a reservoir is pumped to the bearing linings through holes drilled in the end shield, entering the journals at the horizontal split of the bearing lining and flowing over the bearing surfaces in the direction of rotation. Separate oil lines provide oil pressure to an annular space around the shaft at the inner ends of the bearings to further insure a gas-tight seal.

Both oil pumps operate normally, but in case one oil pump fails a system of checks and valves allows one oil pump to adequately supply oil to both bearings of the motor.

These two 1,000-hp., 3,000-r.p.m., 2,300-volt, three-phase, 50-cycle induction motors are started with full voltage by merely pushing a button and attain full speed from a standing start in less than 30 seconds. Quiet operation is an outstanding characteristic due to the totally inclosed construction, and the motors are so free running that they will coast without load for nearly fifteen minutes before coming to a stop after power is disconnected.

These two General Electric 1,000-hp. motors are the largest of this type ever built and have the largest horsepower rating known to be driving such pumps in hazardous gas locations in refinery service.

Other Motor Drives

All the remaining induction motors in the hazardous area near the combination unit switchboard room shown in Fig. 3 are of totally inclosed, fan-cooled, explosion-proof type. Fig. 4 illustrates a number of these coupled to some of the 49 Ingersoll-Rand centrifugal pumps installed in the new refinery. Other small induction motor drives, such as preheater motors and valve motors, are conventional types.

Water pump, fan and large compressor motors are synchronous, 0.8-power-factor leading, being located outside the hazardous area. All are started by full-voltage magnetic starters, with disconnecting means and short-circuit protection being supplied by D&W cutouts or oil circuit breakers as designated in Fig. 3. A power-factor clause in the schedule of the utility makes available a maximum discount of 10 per cent on the monthly power bill prorated for average power factor maintained in excess of 70.7 per cent. Operation of these synchronous motors results in an over-all plant power factor of nearly unity, compared to values ranging between 80 and 85 per cent for the old refinery.

One of these synchronous-motor installations is shown in Fig. 5, being an Ingersoll-Rand Co. air compressor driven by a General Electric 600-hp., 187.5-r.p.m., 2,300-volt, three-phase, 50-cycle motor. A similar equipment of 100 hp., 273 r.p.m. is located in the background and a 20-hp., 1,500-r.p.m. induction motor-driven compressor in the foreground.

A 25-kva. steam turbine-driven standby generator (Fig. 3) is connected to the 440-volt, three-phase, 50-cycle bus by means of an automatic throwover switch. In the event of power failure by the utility, a solenoid valve automatically starts the turbine, and the throwover switch immediately connects the generator to the bus.

Valve motors, oil pump motors for the two 1,000-hp. charging pump motors, emergency lights and instruments are connected to this emergency power system. Such standby

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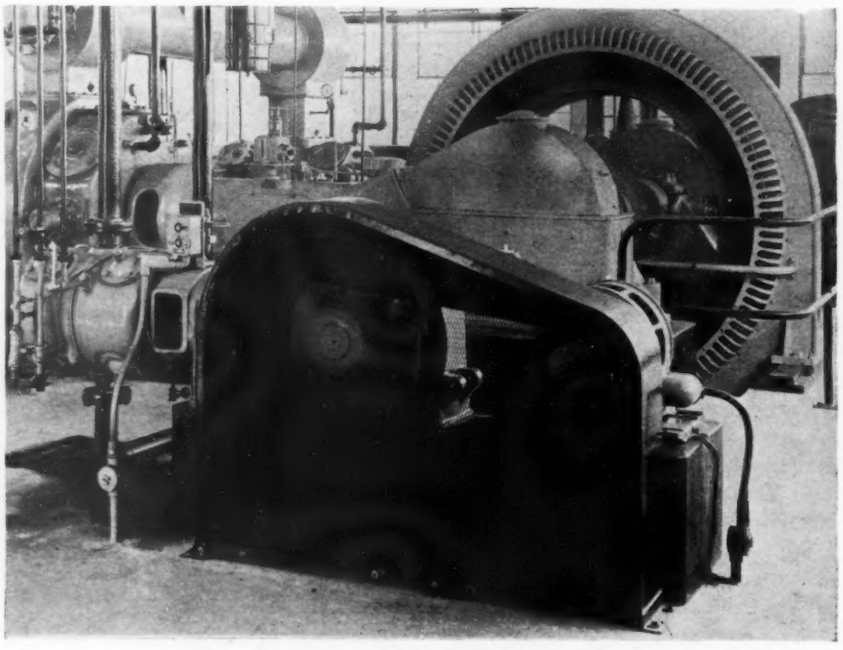


Fig. 5—Air compressor driven by 500-hp. synchronous motor; in foreground is a 20-hp. induction motor, driving an instrument compressor

War Emergency Power From Present Systems

Government-sponsored trunk lines are unnecessary — Wide margin of reserve built into present systems for assurance of service quality is immediately available for emergency use

M. W. SMITH,* *Manager of Engineering, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.*

AS A RESULT of the Administration's decision to have an adequate power reserve for war-time requirements the utilities have been requested to provide a surplus of generating equipment. Strong ties between systems are also deemed necessary to keep industrial and munition plants in operation in the event that local plants are badly damaged by air raids.

It is my opinion that a power supply for war-time requirements can be made available without much disturbance to existing systems, and at a very reasonable expenditure.

Adequate Tie Capacity

The power industries' most immediate concern will probably be the furnishing of adequate tie capacity between important load centers to transfer emergency power in the event that some local plants are badly damaged by bombing raids. Obviously, this could be done by the government erecting a complete superpower system entirely independent of present systems, and we see some indication of activity along these lines. Such an expenditure seems entirely outside the realm of strict economic considerations, and suggestion is made here of means for meeting this problem at relatively small expense and under private control, which would eventually be jeopardized by any kind of government superpower scheme.

At the present time most of the major cities are tied together in some way by transmission lines. In many cases these lines would have inadequate capacity for transfer of the emergency power considered necessary if present-day standards of service are to be maintained. In order to maintain good public relations and further the use of central-station power as against isolated industrial plants, the industry is so accustomed to giving almost perfect service that there is likely to be a tendency for engineers to plan along the same lines in handling war-time emergency power transfer. It seems logical to assume that at such times sentiment will change and the public will be tolerant of interruptions that in normal times would be considered serious. Recognizing this, it is possible to take advantage of the margin normally incorporated in design as a means further to increase the emergency capacity. By so doing, it is believed that the present power interchange capacity of lines would be increased from 50 per cent to 200 per cent, depending upon the particular system. This increase would in many cases be adequate, especially with some reinforcement of local generation.

Emergency Power Measures

Some of the measures which can be adopted to increase the emergency power will now be discussed. Where there are two lines in parallel, one is normally a spare for the other. Obviously, both lines can be loaded to their individual capacity limits. To interchange still more power, the circuits may be operated separately, and a trunk line formed from one by increasing its voltage to the corona limit with auto-transformers, letting the second line continue to carry the intermediate small loads at normal voltage.

While this procedure essentially places dependence on single-circuit transmission, it should be noted that there are cases where important loads have been served successfully for years over single lines. Furthermore, additional reliability can now be obtained by utilizing quick-reclosing circuit breakers, possibly supplemented by single-phase switching, because ties between large load centers that have enormous inertia effects can be opened long enough to extinguish a flashover and be reclosed before the systems have drifted far enough apart to lose synchronism.

Recent tests show that equipment is now available to clear the fault and reclose the circuit in 20 to 30 cycles, which is less than the time required for an object to drop through space a distance of four feet.

Line Reliability

Lines are and can be made more reliable due to the increased knowledge of the behavior of natural lighting. As a consequence, lines for 132 kv. and higher can be built that are practically lightning-proof, thereby reducing the number of interruptions and making single-line operation during the emergency a practical consideration. Ten years' experience on a 50-mile, 138-kv. line built utilizing modern theory shows one outage due to lightning. Likewise, a 230-kv. line operating for the same period has had only one outage. The introduction of protective devices has also allowed a modernizing program on existing lines. Six years' experience on a 69-kv., 35-mile line without and with economically applicable protective devices shows a comparison of an average of 45 outages a year before application of the protective devices to less than three outages a year with the supplemental device. These examples are practical proof that single-line

[*Continued on page 94*]

*Excerpted from recent address to Midwest Power Conference.

New Technique in Glove Testing

Direct-current, high-voltage application promises to reduce percentage of rejections safely and substantially — Test burden lessened — Investigation prompted by experience with d.c. testing of rubber cable

R. W. CHADBOURN *and* **W. H. MEADE, JR.**, *Boston Edison Laboratory*

FROM experimentation in testing about 800 rubber gloves with direct instead of alternating current the following conclusions appear:

1. High-voltage d.c. is more effective than high-voltage a.c. in picking out defects of moderate seriousness, which may develop into hazards.

2. Leakage measurements of high-voltage d.c. may be of much greater value than corresponding measurements on high-voltage a.c. Further investigation is needed before the importance of d.c. leakage measurements can be properly evaluated.

3. Adoption of high-voltage d.c. testing will reduce tremendously the arduousness of inspection and result in a saving, for further use, of 50 to 75 per cent of the gloves being condemned by present standards.

4. This will be accomplished without lowering the factor of safety on the use of gloves, as the tests indicate that 45 kv. d.c. is a much more severe test than 10 kv. a.c. The d.c. test appears to pick out defects serious enough to be classed as potential hazards, whereas the a.c. test only picks out defects if they are serious enough to break down at less than 5 kv.

5. The gloves do not appear to be injured by the high voltage d.c.

6. A one-minute application of the high-voltage d.c. appears adequate to pick out the more serious defects. Longer applications in general only result in breakdown of the rubber at its thinnest point.

It has long been recognized that a routine test of 10,000 volts a.c., made at intervals determined by the character of the service, is not, in itself, a satisfactory check on the condition of rubber gloves used on distribution circuits. For years many companies have laid more stress on a careful visual inspection and have used the 10,000-volt test chiefly as a final check on the inspectors. Chief reliance on visual inspection has many disadvantages. Unless men are alternated frequently between glove inspection and other types of work the inspection becomes extremely tedious. As a result, it is difficult, if not impossible, for a man to maintain continuously the same standard of judgment. Unless the inspection requirements are made very rigid it is impossible to set up an inspection standard which different inspectors can follow consistently.

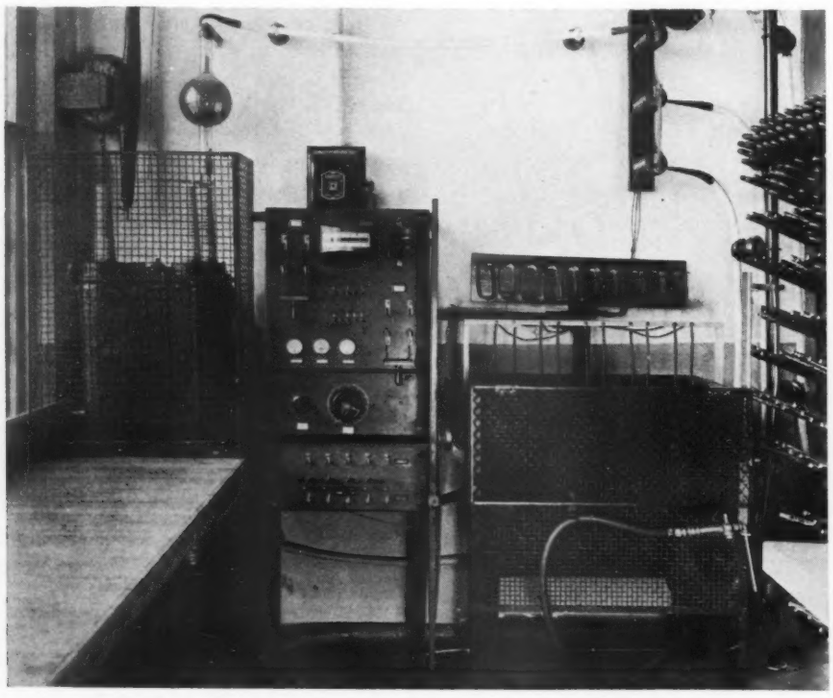


Fig. 1—Test equipment layout for a.c. and d.c. applications at Boston

Previous Test Policy

Because of these difficulties, the Boston Edison Company for many years pursued the policy of fairly frequent rotation of inspectors and very rigid inspection requirements. The company felt that the 10,000-volt test could not be depended upon to pick out defects which might develop into hazards, and that defects could not be satisfactorily classified as major and minor, or serious and trivial, merely by inspection of the part of the defect exposed to view. Gloves were accordingly rejected for *all* visible defects, major and minor. This policy, of course, resulted in a high percentage of rejection, approximately 23 per cent, but reduced the accident hazard to a minimum. It was recognized that many of the gloves rejected were satisfactory for further service, but until a more satisfactory test and inspection standard could be devised it was felt undesirable to risk lowering the factor of safety.

Experience in testing other rubber products, notably rubber-insulated cable, had shown that high-voltage d.c. is more effective in picking out incipient faults than high-voltage a.c. It was thought that the use of high voltage d.c. for testing rubber gloves

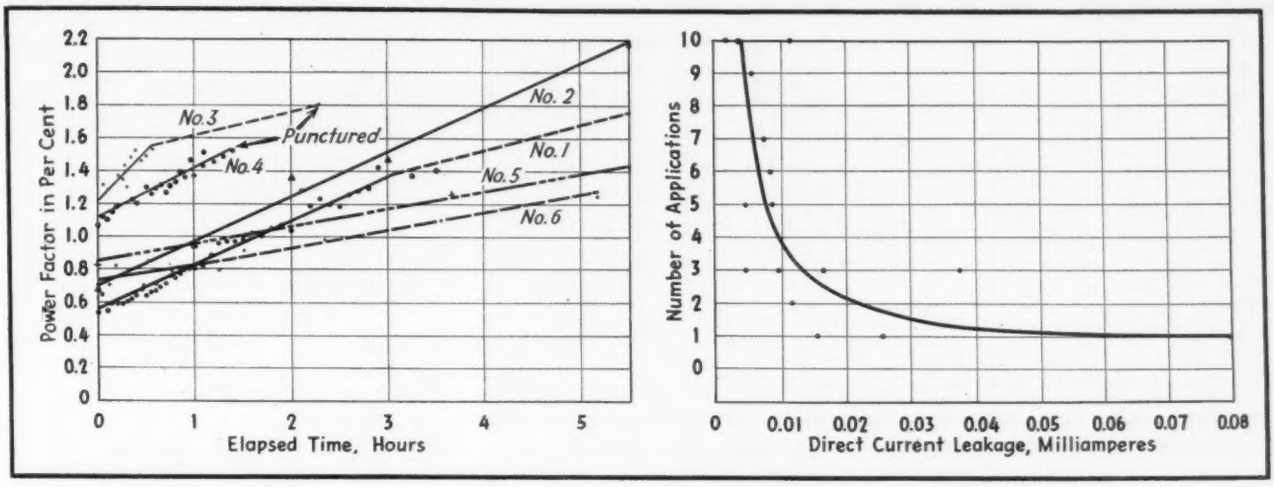


Fig. 2—Time-power factor relationship on 50-kv., d.c. applications

Fig. 3—Relation between leakage and breakdown for repeated d.c. high-voltage applications

might be so successful in picking out incipient weaknesses in the gloves that a considerable percentage of those being condemned by inspection could be reclaimed for further use without any decrease in the factor of safety.

For the investigation, a number of gloves that had been condemned by inspection were selected. From these were excluded those having very glaring faults. The first step consisted in subjecting a number of the remaining gloves, chosen at random, to the usual 10,000-volt a.c. test, then raising the voltage slowly up to breakdown. Another group of the remaining gloves, also picked at random, was tested on d.c., voltage being raised at the rate of 5 kv. per second from zero to failure. For this purpose a single kenotron tube was used (Fig. 1), with sufficient capacitive ballast to limit the ripple to 3 per cent. These tests resulted as follows:

	Total Tested	Flashed Over	Punctured Through Defect	Punctured Outside Defect
A.c.....	36	6	2	28
D.c.....	35	19	14	2

These preliminary tests indicated a rather marked superiority of the d.c. in picking out defects. The two gloves tested on d.c. that broke down outside the defect for which they were condemned probably failed at concealed defects, evidence of which was destroyed by the breakdown, as the voltage of failure was low. The water levels, on test, were adjusted to permit flashover at about 52 kv. D.c. breakdown values ranged from 19 to 52 kv.

To determine whether the time of application of voltage on these short-time d.c. tests was adequate to pick out all defects which might be considered serious, long-time tests were made on fifteen of the nineteen gloves which flashed over; 25 kv. was applied for five minutes and the voltage increased in steps of 5 kv. every five minutes until breakdown occurred; of these fifteen, three flashed over, two punctured at the defect for which they were condemned and the remaining ten punctured outside the defect. Measurements of thickness were then made on these last ten both at the point of failure and at the defect. In all cases the thickness was less at the point of failure than at the defect, in amounts varying from 5 to 27 per cent, the average deviation being 15 per cent. These tests indicated that, as a substitute for or an aid to the process of visual inspection, the longer test period was of little value, and that the short-time test, in which the voltage was raised at 5 kv. per second from zero to failure, was adequate to pick out defects of a serious nature.

The question was then raised as to whether application of a high d.c. stress injured the gloves. To determine this six gloves were immersed in water and one-minute applications of 50-kv. d.c. were made every three minutes on four of them. After each application of d.c. the power factor was measured. At intervals, the power factor of the other two gloves was determined. The results of these tests are shown in Fig. 2. Of the six gloves, 1 and 2, 3 and 4 and 5 and 6 were similar. Gloves 2 and 5 were not energized with d.c. All the gloves show an increase in power factor, and it is of interest to note that the rate of increase is the same for corresponding gloves of the same pair, although one was subjected to d.c. and the other not. At the conclusion of the d.c. tests the gloves were dried out for two days and a final power factor test made. In every case the power factor was almost exactly the same as at the beginning of the tests. These tests indicated that, so long as the gloves are immersed in water, the power factor shows a gradual increase, caused by gradual absorption of water, but that the application of repeated unidirectional stresses has negligible effect upon the power factor. It was concluded, therefore, that the gloves were undamaged by the high voltage d.c.

Preliminary D.C. Tests

The possibility of using leakage current as a criterion of condition was also considered. It was felt that d.c. leakage would change far more rapidly with change in glove conditions than would a.c. leakage, as the latter consists largely of charging current, which is not much altered by the development of defects. A series of d.c. leakage measurements was made on a small group of gloves and the gloves were then subjected to repeated applications of 50 kv. d.c. until breakdown occurred. The results are shown in Fig. 3. In spite of the small number of gloves thus tested, there appears to be a very definite relation between leakage and the dielectric strength.

These preliminary tests with d.c. indicated that the company's inspection standard might be materially lowered and a large percentage of

gloves formerly condemned now salvaged for further use, without any lowering of the factor of safety and with some decrease in the labor of testing. To obtain further data several hundred gloves previously condemned by the company's rigid inspection were subjected to the following procedure:

1. The gloves were given a d.c. test, voltage being raised from zero to 30 kv. at the rate of 5 kv. per second. Leakage measurements were made at that voltage. The voltage was then raised at the same rate to 45 kv., held at that value for one minute and then removed.

2. The gloves were then subjected to the usual a.c. test of 10 kv. These tests resulted as follows:

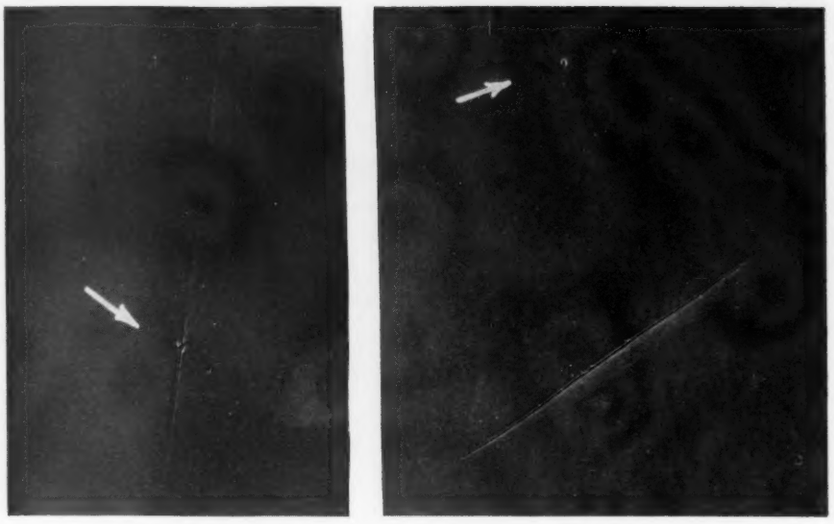
Total number of gloves tested	390
Number of gloves containing so-called major defects	133
Number of gloves containing so-called minor defects	257
Number of breakdowns in gloves containing major defects	58
Number of breakdowns in gloves containing minor defects	30
Total breakdowns	88
Per cent breakdowns of total tested	22.6
Number of breakdowns through defects	68
Number of breakdowns through spots other than defect	20
Number of breakdowns on a.c. high potential test	0

Another group of gloves from the same lot was subjected to similar tests, with the order reversed, the 10 kv. a.c. test being applied before the 45 kv. d.c. test. The results of these tests follow:

Total number of gloves tested	296
Number of gloves failing on a.c. test	20
Number of gloves failing on d.c. test	41
Total breakdowns	61
Per cent breakdowns of total tested	20.6
A.c. breakdowns through defects	15
D.c. breakdowns through defects	37
A.c. breakdowns through spots other than defect	5
D.c. breakdowns through spots other than defect	4
A.c. breakdowns below 5 kv.	14
A.c. breakdowns below 5 kv. through defects	14
A.c. breakdowns above 5 kv.	6
A.c. breakdowns above 5 kv. through defects	1

At first glance, these last results seem inconsistent with the results of d.c. and a.c. tests quoted earlier in the paper. It is significant, however, that, of 20 a.c. breakdowns, fourteen occurred at less than 5 kv., each through a glaring defect. Defects of this magnitude were excluded from the first set of tests. Of the remaining six a.c. breakdowns, only one occurred through the defect for which the glove was condemned. This is in line with the previous tests.

The superiority of d.c. over a.c. in picking out defects of moderate seriousness is illustrated in Figs. 4 and 5. Cuts of identical depth were made in two similar specimens and each specimen tested between 2-in. disk electrodes, one on d.c. and the other on a.c., to the point of breakdown. On d.c. the test specimen failed in the cut; on a.c., breakdown took place some distance away from the cut. The failure of a.c. to pick defects appears quite pronounced until the defect becomes so bad that its dielectric strength is reduced to a value of less than 5 kv.



Fif. 4 (Left)—Section of rubber glove with cut of predetermined depth tested to failure on d.c. Fig. 5 (Right)—Section as in Fig. 4 tested to failure on a.c.

More test data are of course desirable before existing test standards are altered, and this is being accumulated as fast as possible. The information so far obtained indicates that a cursory inspection, eliminating all gloves with very bad defects, followed by the d.c. test on the remaining gloves, will constitute an adequate test program. If, as the tests to date indicate, the percentage of rejections can thereby be reduced from 23 to a 5 to 10 range with a marked reduction in the arduousness of testing, and a possible reduction in the time of testing, the proposition assumes considerable commercial importance.

F.P.C. Chairman States Attitude Toward Power Industry

[*Continued from page 40*]

jority of these contacts we find a friendly reception. Generally, those in immediate touch with the public needs recognize that the lack of co-operation not only causes difficult and expensive administration, but is productive of injury to the whole industry as well as to the public. Parenthetically, it may be said that any substantial hindrance encountered has been in cases where remote control has been exercised, and those only in infrequent instances.

The co-operation so far received from the industry as a whole is ascribed by us to the fact that the law was wisely drafted, that the prescribed rules and regulations are reasonable and that the commission, having in mind the public interest, has pursued the administration of the act in a friendly spirit. The commission does not intend that its attitude toward the industry will change.

Sincerely yours,
CLYDE L. SEAVEY,
Acting Chairman.

New Refinery Has New Uses for Electric Service

[*Continued from page 44*]

power makes possible shutting down the complete unit gradually even in the event of complete loss of power service from the utility.

Single-phase, 110-220-volt power for lights and special control is obtained through a bank of three 50-kva. transformers located outside the hazardous area, operating on a 2,300-volt feeder from the bus in the combination unit switchboard. Localized lighting distribution panels are conveniently located throughout the new plant, are of oil-immersed type for the hazardous locations and all use no-fuse type circuit breakers.

Specify Permissible Noise for Power Transformers

Power transformers for distribution substations purchased under specifications limiting noise—Sound level measurements are found practicable, inexpensive and dependable

A. P. FUGILL, *Detroit Edison Company*

WITH noise elimination campaigns being conducted in many communities, the noise produced by electrical equipment, particularly power transformers, is becoming an important factor in distribution substation design. To forestall customer complaints it has been found desirable to use reasonably quiet units, especially if the transformers are located outdoors in predominantly residential neighborhoods. Although the degree of quietness required is largely dictated by local conditions, the experience of one public utility company serving a metropolitan area may be a guide for other companies confronted with a similar problem.

During an investigation of transformer noise extending over a period of about five years the Detroit Edison Company has found that, even for the same rating, transformers vary widely in noise characteristics. In the few cases where justifiable complaints of noise have been received it was possible to satisfy the complainants by replacing the noisy transformers by others which sound level meter measurements showed to be considerably quieter.

From noise studies on existing installations and measurements on modern transformers it was concluded that, at the present time, most transformer manufacturers are able to furnish, with no additional charge for quietness, transformers of standard design which are satisfactory for most installations on this system. Since even modern transformers of standard design, however, are not all equally quiet, the Detroit Edison Company now purchases all power transformers for distribution substation service under specifications limiting the maximum permissible noise, in order to insure that only satisfactorily quiet units will be obtained in the future.

Specification limits have been set with due regard to the values obtainable from the standard units of most manufacturers, but, at the same time, these limits will exclude transformers which past experience has indicated may be objectionable. It is expected that it will be possible to lower the specification limits as additional experience is obtained.

Transformers purchased under noise specifications are measured as they are received to determine whether the specifications have been met. Accumulated experience with noise measurement has proved that the measurement of transformer noise with a sound level meter, although it requires a special technique, a trained personnel and good judgment in interpreting results, is, nevertheless, entirely practicable, relatively inexpensive and sufficiently dependable for the purpose.

Due to the peculiar characteristics of sound, consistent results can be obtained from sound measurements only if standard measuring equipment is used and definite methods of measurement are employed. A large part of the earlier work in sound measurement was concerned with the development of standards which could be used whenever noise measurements were made. At the present time general standards covering measuring equipment and methods are available. The American Standards Association has adopted three such standards—one on acoustic terminology, one on noise measurement and one on sound level meters. The American Institute of Electrical Engineers has issued a test code for apparatus noise measurement covering the general phases of the problem. The National Electrical Manufac-

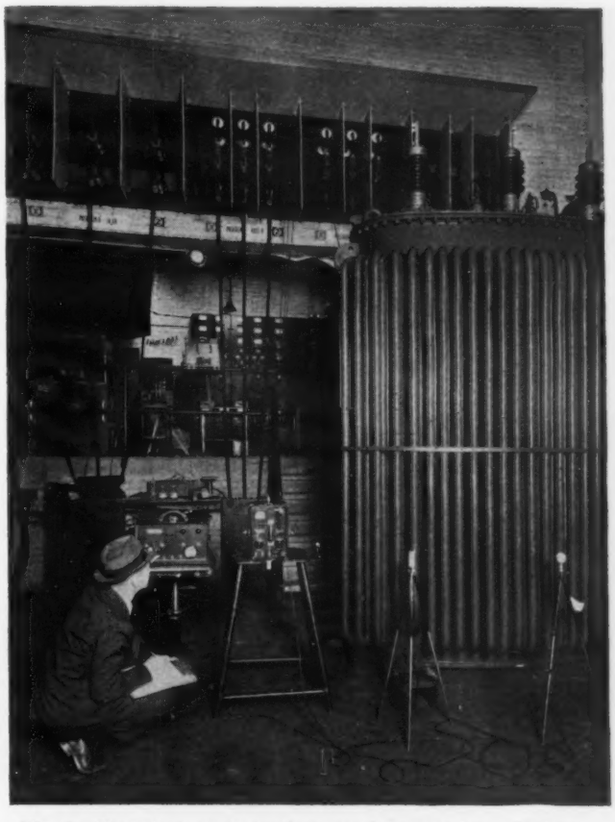


Fig. 1—Acceptance test involves no determination. Test on 1,500-kva. unit requires about one hour

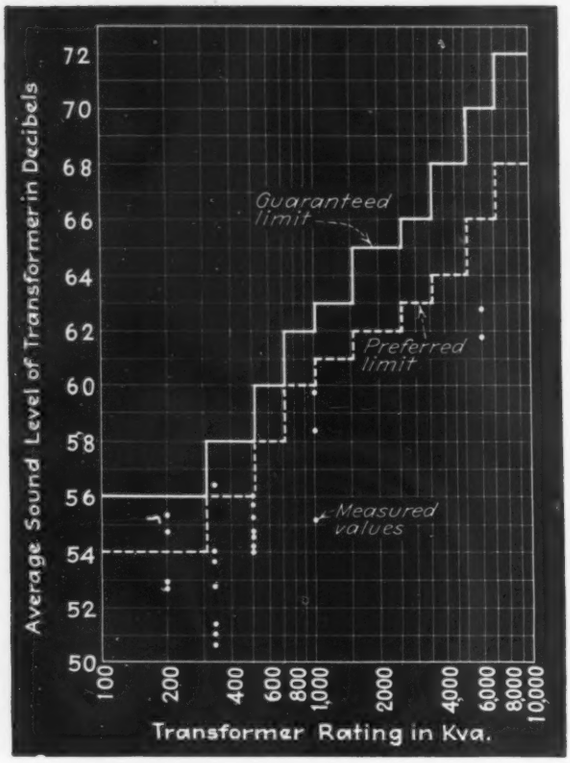


Fig. 2—Tests on 23 units show many with noise levels well below preferred limits

All shown are self-cooled units with individual cooling tubes welded to tank

turers Association has developed a transformer noise test specification for the use of its members. The Detroit Edison Company has prepared a specification describing the method which it uses in measuring transformer noise. Excerpts from this specification, which is in general agreement with the national standards, are published elsewhere in this article.

Several makes of sound level meters which conform to the present standards are available and have been adequately described in the technical press. In all such meters the output of a microphone is amplified and measured to indicate the sound level of the sound in decibels. Some means is provided for field calibration while the meter is in use, but over-all laboratory calibration is required at intervals of a few months to a year or two, depending on the service. Since the laboratory calibration requires rather special and sensitive equipment, it should usually be done by the meter manufacturer or at a standards laboratory properly equipped for such work. A sound level meter is comparatively simple to use, but a moderate amount of training and experience is necessary to insure that an operator will obtain accurate and reliable results.

Acceptance testing for transformer noise is done according to the procedure outlined in the specification in a test cage at the receiving warehouse. Since a sound-proofed room is not available, the measurements have to be made after the regular working hours in order to obtain a sufficiently quiet ambient. Inasmuch as the warehouse is near a railroad as well as a busy thoroughfare, there are occasional interruptions from extraneous noise. In spite of these interruptions, however, a complete set of measurements on one transformer can usually be made in less than an hour, including the time for placing the unit and for connecting it to an available source of power supply.

The photograph reproduced in Fig. 1 was taken during an actual acceptance test on a 1,500-kva., three-phase transformer. Since one position of the microphone cannot be depended upon for consistent results, except for very small equipment, in the complete test, the microphone is moved successively around the transformer in order to obtain the average sound level for the unit. At the time the photograph was taken two sound level meters of different makes were being used to obtain a check between meters. For the usual acceptance test only one meter with its microphone would, of course, be used.

Results Checked

During the several years of experimentation with the measurement of transformer noise numerous checks have been made to indicate the accuracy of the measured values. Certain transformers were measured for noise time after time under all kinds of conditions, at several locations, with different meters and by a number of individuals. Space does not permit the presentation of much of this evidence, but one set of measurements made recently shows typical results for this sort of comparison. In three cases similar measurements were made on a transformer by the transformer manufacturer at his factory with his meter and by the Detroit Edison Company with its own meter both at the factory and at the receiving warehouse after shipment. The average noise in decibels, as shown in the following table, indicate a general agreement of 1 to 2 decibels, usually less than 1 decibel:

Condition	Case 1 Db.	Case 2 Db.	Case 3 Db.
Manufacturer's meter at factory..	53.7	55.0	56.8
Detroit Edison meter at factory..	53.0	55.2	56.0
Detroit Edison meter at warehouse	53.0	54.7	55.2

Check tests such as this one indicate rather conclusively that with correctly calibrated meters, good operators, proper technique of measurement and suitable ambient conditions the average measured noise from a particular transformer should not vary more than 1 to 2 decibels, no matter where the test is made nor by whom the measurements are taken. This is sufficient accuracy to differentiate between satisfactory and unsatisfactory units in acceptance tests.

Noise Limits Specified

As stated previously, the Detroit Edison Company has determined preferred limits for transformer noise which are believed to be satisfactory for most installations on its system at present. Certainly transformers appreciably noisier would not be considered acceptable, but it should be pointed out in this connection that a difference of 1 decibel is scarcely noticeable and a difference of 2 decibels would not be considered serious. These preferred limits, plotted against size of transformer in kva., are given by the dotted, stepped curve in Fig. 2. At the present time, however, transformer manufacturers are not willing to guarantee these limits for standard transformers because of the erratic nature of transformer noise and the limited experience in measuring it. Most manufacturers, however, are willing to guarantee for their standard units the limits shown in Fig. 2 by the solid stepped curve. Since most transformers manufactured today will measure lower than the dotted curve, even without special attention paid to quietness, it is felt that the manufac-

[*Continued on page 95*]

Fifth Avenue Jeweler Adopts Gaseous Discharge Lamps

Fluorescent lighting demonstrates effectiveness for customer examination of jewelry and precious stones under conditions which are ideal for bringing out their full beauty and appeal

THE RECENT opening of a Fifth Avenue jewelry shop, Marcus's, is of special interest to the far-seeing engineers who, a decade ago, predicted that the gaseous discharge type of light source would one day replace the incandescent filament lamp for illumination systems. Not that this shop is yet one which has abandoned the old forms completely, but it does utilize three new gaseous discharge lamps.

According to General Electric advices, in private examining rooms near the front of the store (Fig. 1) rooms which contain rectangular desks lighted by rectangular luminaires 3 ft. above them, carbon dioxide tubes furnishing diffuse light are used. The light emanates from 16-mm. tubes each 5 ft. long, at a color temperature approximately 8,500 deg. Kelvin, "whiter" than an overcast sky.

In the main selling space (Fig. 2) overhead luminaires of a truncated-cone shape generate light about equal in color temperature to average sunlight. These are powered by 300-watt inside frosted Mazda filament lamps and the new 100-watt fluorescent tubes in combination, one of each for each fixture.

In the stationery department (Fig. 3) in the second room, flush-mounted fittings which are rectangular in shape house two daylight fluorescent and two white fluorescent lamps each. The white lamps have a slightly pinkish cast and their combination with the daylight lamps produces a color slightly warmer than average daylight. Similar flush-mounted units closed by configurated glass plates light the opening between the two rooms, the luminaires containing daylight lamps of the fluorescent type.

It would have been entirely feasible to light the rest of the space with the newer forms of fluorescent luminaires and no doubt the next generation of architects and designers will utilize this kind of lighting to an even greater degree.

Fig. 1—Barkon carbon dioxide lamp used by Fifth Avenue jeweler produces light about 8,000 deg. Kelvin *(Photos from General Electric)*

Fig. 2—Each ceiling unit contains new 100-watt fluorescent tubes and 300-watt Mazda filament lamps

Fig. 3—Each unit in this display room houses two daylight fluorescent and two white fluorescent lamps

Editorials

S. B. WILLIAMS, *Editor*

Net Building and Load Building

ARE ALL LOADS equally desirable? What is the relative value of different kinds of load as revenue builders? Which offer the greater and which the lesser opportunity for net profit? What is the cost to sell and to serve each? Can certain loads, unprofitable in themselves, be made profitable by balancing them with other non-profitable loads? What loads are profitable at certain times, but under rapid business fluctuations unprofitable at other times?

These are questions which utility managers are now considering and which are at the bottom of selective load building. These are some of the questions which if properly answered, and the answers are applied, will help a company to build net and maintain return.

While the very nature of the utility business requires it to serve offered load along its lines, there is nothing to prevent it from pushing the business that is profitable or to put no pressure behind unprofitable business. In this respect the utility business is no different from any other business. A merchant, for instance, will carry all kinds of commodities in stock, but the greatest sales effort will be put behind the items that contribute most to the net.

There is, however, this one fundamental difference. The merchant knows which items are the more profitable. Few utilities, on the other hand, have made the analyses necessary to determine the relative profitableness of different loads. In fact, there are many utility men who defy one to segregate the costs to serve different classes of load with any degree of accuracy.

It is necessary to segregate these costs with accuracy in order to arrive at relative values? If we assume the same premises in the analysis, will not the same relationships hold?

Not only is it necessary to know the relative cost to serve but, in arriving at a successful program of selective selling, it is essential to know the cost to sell in terms not only of gross revenue but in terms of net. The combination of the two will bring a load-building program which will put the most effective load on the lines and bring the best results down in the lower right-hand corner.

This cost analysis, to be effective, must be applied to all types of load. And when it is so applied it may easily be that certain loads once thought most desirable will no longer be attractive.

There will, of course, be times when other factors require one to fight for a certain load, but, in general, the sooner a utility knows the relative cost characteristics of its load and sells in accordance therewith, the sooner will it have a more effective control of return on investment.

Contracting Construction Work

TIME WAS when utilities did all of their construction work outside of buildings. Now more and more are turning to contractors, and we venture to predict that in another ten years we will find this fairly general. The reasons are not hard to find:

When the industry was expanding its territory there was construction work to be done in good years and bad, and as a result a construction crew could be kept together. Today construction work is up and down, so that it is impossible to keep an adequate crew employed. It was found two years ago when new gangs were taken on that they were untrained. Work therefore was costly and accidents were numerous.

Since much of the construction of the future will be as and when needed, and therefore with little time for completion once it is started, contractors will be in a better position to get men.

Contractors will bid to a price so that costs for work done in competition are not apt to be challenged by the FPC or other regulatory bodies in establishing values. On the other hand, if power companies do their own construction, there is a lot of adjustment to be faced as well as delay. Some water-power jobs have been a decade or more in arriving at final allowable cost.

Contractors will more and more be able to do the work for less money than the utilities. They will not have the same difficulties with organized labor. Efficiency of labor is better. The men do not look to them for the same security of employment as they do to utilities. When work is slack the men expect a full pay check when working for a utility. This non-productive cost must be figured in when comparing costs by the two methods.

There will, of course, always be a certain amount of construction labor on the utility payroll to do run-of-mine

work too small to be contracted. There is enough of this type of work to keep a number of men busy. Also, it will be necessary to keep an engineering staff. The difference, at least as we now see it, will be that major construction, be it the construction of a new line or the rebuilding of an old one, or the erection of a substation, will be let.

The Truth, the Whole Truth

WITH the publication by the Federal Power Commission of its voluminous "Statistics of Electric Utilities in the United States for the year ended December 31, 1937," there is made available for the first time a mass of comparable data on 385 utilities, constituting virtually the whole privately owned industry, which will be extensively used for reference.

In the present releases announcing the appearance of this compilation the commission reproduced several tables and extracts from the text. Unfortunately, some of these are likely to be misinterpreted by newspaper readers when standing by themselves, although they are informative and entirely appropriate when taken with their context in the report.

One of these compares the aggregate of plant accounts, electrical and other, with the annual revenue. The ratio is about $5.50 of the former per dollar of revenue.

By referring to the report itself, however, it is found that the revenue figure used in deriving this ratio includes sales to other electric utilities, approximately balanced by purchased power in the table of operating expenses. If this item, representing intercompany business, is eliminated the ratio of plant account to revenue proves to be 5.9 to 1.

Moreover, plant account does not constitute the entire capital invested. If cash and working funds, materials and supplies and a few other items are included there is a further increase. The ratio becomes 6.2 to 1.

Comparing total balance-sheet assets with annual revenue (including intercompany sales) the report shows a ratio of 6.7 to 1. While this ratio would overstate the investment because of counterbalancing items on the liability side it might, with propriety, have been included in the release.

Another release gives combined electrical operating revenues $2,157,277,266 and operating expenses $928,628,547, which would seem to leave a profit around $1,229,000,000.

What the newspaper reader may overlook is that the sentence "such expenses do not include amortization, depreciation and taxes" covers somewhat more than a half-billion dollars of charges that are quite as inescapable as operating expenses, as appears from the table in the report itself. Interest and other income deductions take another $330,000,000. The upshot is that after including non-electric operations, the amount left for dividend surplus comes out as $509,478,616, which is only about two-fifths of the apparent profit that might be inferred from the release.

The Federal Power Commission is an authoritative agency. Its statistics constitute valuable additions to our knowledge of the industry. On the present occasion its choice of material for public announcements is the sort of thing that gives rise to the criticism of bias. One is reminded of the dictum of a prominent engineer of former years: "A report should be so written that it not only can be readily understood but that it cannot be willfully misinterpreted."

Handling the Welding Load

ELECTRIC WELDING is becoming a universal and useful application for all kinds of metal fabrication. The welders are of many types and ratings to fit the many industrial jobs. Utilities generally, as well as factory managers, welcome the increased use of electric welding, but in some utility quarters there is a growing sentiment that the welding load should be regulated or restricted because of the consequences of the peculiar characteristics of the load.

Welders of any appreciable size, especially those used on multiple-welding cyclic operations, create a peak demand that is inordinately large relative to energy consumption. Also, they often cause a pulsation in the system that interferes with the quality of service delivered to the rest of the factory and in the adjoining utility area. Even small welders, if not accompanied by motor load, may create repetitive peaks and flickers that affect service quality. The cost of correcting these conditions occasionally runs high and out of all proportion to the revenue from the welding energy use.

What's to be done? In the general case, where a factory uses welders in connection with other power loads and where the substation capacity is ample to care for the combination, it is customary policy to put no restriction upon the use of welders. In the special case of large or multiple welders or wherever welders make up the principal load, it is advisable to work out each case in consultation with the customer. The rules, the rate, the metering and the installed equipment may be modified to get the most advantageous joint arrangement for the utility and the customer.

As a general rule, special metering, special rates or rules for welders would be out of line with the policy of universal use of electricity. Use of welders should be encouraged and their further development may be expected to give better load characteristics. Meanwhile, there is also the expectation that corrective equipment can be enhanced in its ability to dilute the flicker consequences. At this stage it is, therefore, best to handle as special cases the occasional welder installations that give trouble.

Uncle George's Influence Wanes

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

ONLY the folks who have known George W. Norris since he first entered the Senate, back in March, 1913, or better still those who knew him during the ten years preceding that, when he was carving out a reputation in the House of Representatives, understand the tremendous power he has wielded for so many years now on everything in general, and on questions involving the electric industry and public ownership in particular.

This is of interest now because a cloud seems to be rising on the horizon of his long domination of Capitol Hill so far as utility legislation is concerned. This is not a prediction as to the outcome of the present TVA differences between the House and Senate. As this is written, that all depends on Uncle George, and Uncle George is not always a predictable person.

Wine, but Not Beer

For instance, that day long ago when the Senate was debating wartime prohibition. The constitutional amendment was sure as death and taxes, but, not satisfied, the prohibitionists were using the excuse that grain and fuel were needed for war purposes to bring the hoped-for consummation of an arid nation into effect sooner.

Jim Wadsworth of New York was speaking. He painted an attractive picture of the French peasants, their wine making and their wine drinking. What a delightful drink a winecup was, the small alcoholic content of wine still further diluted with fruit juice and ice. There was a great deal of sympathy and hero worship for the French people at the time. Moreover, Wadsworth's words about the French peasants touched Uncle George deeply. All his life he has been for the peasants—against the aristocrats.

Senator Norris could stand it no longer. He rose and inquired if the senator from New York would be satisfied if wine were exempted from the wartime prohibition bill.

"I would like to save beer, too," said Wadsworth.

Norris threw up his hands. His momentary weakness in his long fight against alcohol had passed. The bill went through without exempting wine.

"Beer" was a symbol to Uncle George. He once said to the writer: "They talk about 2 per cent beer not being intoxicating. It would make *me* drunk."

There are a lot of other symbols in Uncle George's perspective, unfortunately, for the men and women whose savings and inheritances are invested in utility securities. Because beer would intoxicate *him*, beer was wicked. It should be kept from everybody. Because he was raised in poverty—and still remembers it (he says in his biography in the Congressional Directory, "was compelled to work out among the neighboring farmers by the day and month during the summer") he has an inherent distrust of any one with what he regards as a lot of money. Because he has known certain utility executives to resort to sharp practices, to charge the poor too much and to milk their stockholders—*all* utility executives are, *ipso facto*, beams to be cast out of the country's eye.

The Washington Effect

Lots of men have come to Congress with that sort of attitude. But most of them, if they stayed in Washington long enough, mellowed at least a little. Some of them got a few dollars themselves. Some of them rubbed elbows with the wicked and found out they were human beings. Some of them were beaten by the wicked if they didn't mellow enough. None of these things happened to Uncle George.

But there is a discernible rift in the lute. Uncle George has run up against something he *ought* to have known all about. It is nothing less than the pride of the House of Representatives. He may win this time or he may not. That may be known before these words appear in print. But he has hurt that pride, and the hurt will not heal. Nothing lasts forever, and various members of the House as well as the Senate were getting a little tired of the Norris dictatorship anyhow.

So when Norris appeared as the *only* senator to represent the upper house in the conference on the TVA hundred-million-dollar bond authorization bill—that measure to provide power to pay for electric properties in Tennessee which the TVA was going to take over—he was taking a chance.

Uncle George Is Stubborn

Nobody might have known about it, but Andrew J. May, chairman of the House military affairs committee, was enraged at Norris' unyielding attitude. So he issued a statement which began:

"Responsibility for the present stalemate of the House and Senate conferees . . . is squarely on the shoulders of Senator George W. Norris. It is a sad commentary on our Democratic system of government that one member of 'the most deliberative body in the world' does not know the meaning of the word compromise and presumes to impose his will, arbitrarily and arrogantly, upon the House of Representatives."

It is not surprising that the other Senate conferees did not attend the meetings. They did not want to get involved in a controversy with Norris. Nobody does. It is not very healthy politically. When everybody assumes that one's antagonist is absolutely honest and sincere one starts out with two strikes and an unfavorable umpire. And it was so easy to say to Norris: "Just go ahead and chew those House fellows up. We are behind you 100 per cent." Especially as there were such marvelous

[*Continued on page 97*]

NEWS OF THE WEEK

Compromise TVA Measure Approved by Conferees

Bond issue of $61,000,000 approved by House-Senate group — Money derived from sale earmarked — Representative May discusses far-reaching significance of conference report

The two-week deadlock between the Senate and House over authorizing the Tennessee Valley Authority to issue bonds for purchase of the Tennessee Electric Power Co.'s properties and other privately owned utility properties was ended this week when the conferees agreed on a compromise.

Conferees reduced the bond issue from $100,000,000 as proposed by the Senate to $61,000,000 voted by the House. Although parts of the House version, relating to restrictions upon the TVA, were stricken from the conference report, it nevertheless earmarks the money to be derived from the bonds.

May Interprets Report

In announcing terms of the compromise Representative May of Kentucky, chairman of the House conferees, said:

"Constructive action, which means much to the stabilization of all business, is represented in the compromise agreement arrived at by the House and Senate conferees on legislative proposals affecting the development of the TVA. . . . As a further restraint upon the TVA authorities, a binding memorandum has been made by TVA officials that none of the moneys appropriated to the authority for the fiscal year of 1940 will be expended in development work outside of the specified area, with special reference to northeastern Mississippi and northern Alabama.

"Adoption of the conference report will mean that the TVA cannot extend its operations beyond the general limitations of the proposed amended bill without further authorization and appropriation by the Congress. The far-reaching significance of the conference report concerns the assurance given to business as a whole, and to the electric utility industry in particular, that the trend toward state socialism has been definitely stopped. I am confident that no future Congress will lend an ear to the pied pipers of subsidized federal hydro-electric power."

The conference report provides that the bonds may be used for the following purposes:

Purchasing electric utility properties of the Tennessee Electric Power Co. in an amount not to exceed $46,000,000.

Loaning, under the authority of Section 12 (a), to such municipalities within the purchased area as may desire loans for the purpose of purchasing electric utility properties of the Tennessee Electric Power Co., Alabama Power Co. and Mississippi Power Co., an amount not to exceed $2,000,000.

Rebuilding, replacing, repairing electric utility properties purchased from the Tennessee Electric Power Co., Alabama Power Co. and Mississippi Power Co., an amount not to exceed $3,500,000.

Constructing such electric transmission lines, substations and other electrical facilities necessary to connect the electric utility properties purchased from the abovementioned companies to the electric power system of the authority, an amount not to exceed $3,500,000.

Purchasing electric utility properties of the Alabama Power Co. and Mississippi Power Co. in northern Mississippi and northern Alabama, an amount not to exceed $6,500,000, which should end the present duplication of transmission facilities by the TVA in Mississippi and elsewhere, according to Mr. May.

The agreement between the TVA directors and Wendell L. Willkie, president of the Commonwealth & Southern Corp., expired last month under the original terms, but by further agreement it was continued pending the outcome of the conferees' efforts.

Negotiations between the TVA and Commonwealth & Southern are expected to get under way within the next few weeks on the sale of the properties in certain counties in northern Alabama and northern Mississippi. The overall price for the facilities to be sold, including distribution systems to be acquired by various municipalities in the area, is expected to aggregate approximately $13,000,000.

•

Scores Duplication of Power in Seattle

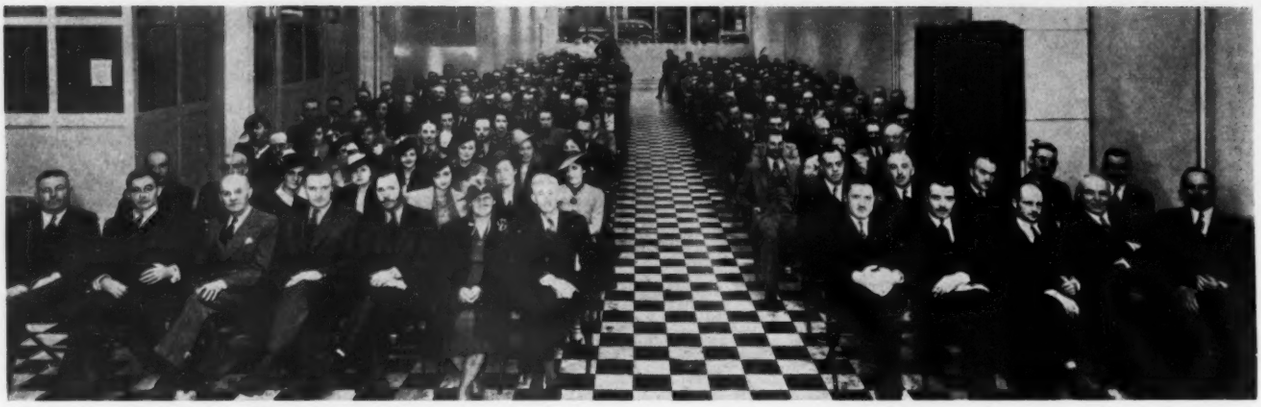
Purchase of all private utility facilities in Seattle for public operations as the "only logical step" to correct the situation in the area was proposed in the 1938 annual report of the Department of Lighting of Seattle.

It was declared that the duplication of private power facilities in Seattle is "a complete waste" to the extent of $3,000,000 a year and is paid for "only by the people in their light bills."

W. J. McKeen, acting superintendent of lighting, noted in the report that this annual loss is "constantly growing" and that if the condition is not corrected "we may expect soon to be wasting four to five millions of dollars annually."

Mr. McKeen pointed out that if the savings that can be effected by the elimination of duplication are put into effect at once, the "business of the private company will have been largely paid for in cash in a few years and the people will have saved for themselves in actual cash many millions of dollars. Seattle is served by both the Puget Sound Power & Light Co. and the public plant, known as City Light. Customers are about evenly divided.

The report promises that all rates for electric light and power will be cut in half after duplication is fully eliminated and that this can be done



MODERN KITCHENS—Montana Power Co. recently arranged four industry meetings in its district for employees of manufacturer, distributor, dealer, contractor and utility organizations to discuss the modern electric kitchen

"without one cent of cost to the taxpayers or without any lien whatever being placed against the properties of the taxpayers, or against either the existing properties of City Light or the properties that would be acquired from the company." The lien, it was said, will be solely against earnings.

•

Oppose Interference In Utility Operation

The Georgia Public Service Commission contemplates no move which would interfere with the management of street car service to the extent of compelling an experimental revision in fares in Atlanta, according to Chairman Walter R. McDonald.

He pointed to the decline of street car systems in Georgia to the point where only two—in Atlanta and Savannah—survive and added that one of these, Savannah, was operating at a heavy loss. Any Atlanta loss would have to be made up by users of electricity, affecting 85 per cent of Georgia, the chairman declared.

Mr. McDonald pointed out that while the street car company of Atlanta is not operating at a loss, at the same time the rate of return is far below the sum considered reasonable and adequate. He said that if street car operations showed a loss the deficit in operation would have to be made up by revenue received from electric customers in all the territory served by Georgia Power.

•

Gets License Modification

FPC has adopted an order modifying its requirements for the license to be issued to Grand River Dam Authority for the so-called Pensacola project, in accordance with the request of the Authority (ELECTRICAL WORLD, July 8, page 9).

Duquesne Light Buys Electric Facilities

Purchase by Duquesne Light Co., Pittsburgh, Pa., from the borough of Sharpsburg, Allegheny County, of the electrical facilities owned and operated by the borough for $12,759 has been approved by the state Public Utility Commission.

At present a portion of Duquesne Light's facilities are duplicating those to be acquired from the borough. The transaction will eliminate this duplication and substantially all of the 345 consumers affected will benefit from a material reduction in the cost of service.

Duquesne Light Co. proposes to retire the duplicated equipment from service. This equipment consists of poles, wires, transformers, meters and other electrical equipment.

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Oakes Named President of Birmingham Electric

Charles E. Oakes, for the past ten years manager of the Allentown division of the Pennsylvania Power & Light Co., has been named president of the Birmingham Electric Co., to succeed J. S. Pevear, who was made chairman of the board.

•

Administration's New Lending Plan Presented

The Administration's new lending program went before Congress this week in the form of parallel House and Senate bills proposing the authorization of new type credits totaling $2,660,000,000. The program was amended from its original form in one substantial particular, in that it omitted a projected extension of $500,000,000 in foreign credits. Instead of that item the bill proposed that the $100,000,000 lending authorization of the Export-Import Bank be enlarged to $200,000,000.

Among the authorizations in the new program is $460,000,000 for rural electrification.

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Water Heaters Need of Standardization

The need for greater progress toward standardization of water heaters is becoming much more obvious, says George C. King, chairman electric water heating committee, Edison Electric Institute.

"Our committee is studying sales opportunities and sales handicaps to electric water heating service," Mr. King said, "and is to explore the further possibility of applications which will tend to widen the popularity of this service.

"Yet we find that today there are 94 different wattage combinations actually reported as used in some 25 different tank sizes. This means that more than 2,000 possible combinations can be specified in combinations of wattages and tank sizes alone. And still we have given no consideration to the further peculiarities introduced by round, square or table top tanks, ferrous and non-ferrous tanks, or double and single-throw thermostat connections."

If some standardization could be effected, Mr. King says, both utilities and dealers could reduce heater stocks and inventories, carry fewer spare parts for repairs, spend less time on instructions for sales and service men, regain display space in stores, and still provide the customers with entirely satisfactory electric water heating service.

•

Niagara Case Recessed

Hearing on the Niagara Falls Power Co.'s application for diversion of additional water at Niagara Falls has been recessed until August 8.

Memphis Now Operating Acquired Utility Systems

Becomes first major city in the country to own and operate electric, gas and water systems — Memphis Power & Light receives $15,250,000 from city in sale of electric and gas properties

Municipal ownership and operation of electric, gas and water systems is in full effect in Memphis, Tenn., now that the city has acquired the electric and gas properties of Memphis Power & Light Co., subsidiary of National Power & Light. City operations began on June 27 with brief formalities and ended a 25-year fight for municipal ownership.

Memphis Power & Light will be dissolved with the redemption at 102 and accrued interest $10,000,000 of outstanding 5 per cent first and refunding mortgage gold bonds Series A; and on August 1 at 101.75 and accrued interest the $5,725,000 of 4½ per cent Series C first and refunding mortgage bonds. Redemption of these bonds will clear the way for retirement of the $7 preferred stock at $100 a share.

Acquire Utility Systems

In the deal the city took over electric and gas distribution systems. The TVA acquired the substation and transmission lines, and the Memphis Generating Co. took over the 50,000-kw. steam generating station and two transmission lines connecting Mississippi Power & Light and Arkansas Power & Light with TVA.

Preceding the transfer of the properties Memphis sold $17,000,000 of general obligation bonds to a banking group headed by Bankers Trust Co. of New York on a bid of 100.02 for 3¼ and 2.10 per cent bonds at a net interest cost of 2.1938 per cent. The bonds were divided $5,250,000 gas plant and $11,750,000 electric plant. The city estimated that it saved $900,000 by selling general obligation bonds rather than bonds backed by revenues only.

Memphis Power & Light received $15,250,000 from the city and $2,110,000 from the TVA.

With the completion of the transaction Memphis became the first large city in the country with electric, gas and water systems all municipally owned and operated. The city has a $35,000,000 three-way utility set-up serving 60,000 electrical, 50,000 water and 40,000 natural gas customers. The city already has cut electric rates and expects to effect a 15 per cent cut in the fall. It is estimated that when operating capital has been built up the basic TVA rates will go into effect. This will mean an estimated saving of $2,400,000 to customers. The residential gas rate has been reduced 10 per cent.

Recently the city utility system received an additional PWA grant which raised the total from $3,092,000 to $4,239,258. The additional funds will be used to tie the city power system substations and lines to the utility system acquired and for expansion of facilities. The total cost of the city system and expansion contemplated is $9,420,574, of which 45 per cent is PWA's share.

Officers of the city system include W. W. Mallory, president; William A. Dunkley, gas department head; Mark Eldredge, electric department head; Frank Libby, transportation department head, and Major Thomas H. Allen, vice-president and chief engineer.

•

Halts Utility Purchase

The temporary restraining order halting purchase of the Grays Harbor Railway & Light Co. by the Grays Harbor Public Utilities District was continued in Montesano, Wash., June 26 until July 17 by Judge William E. Campbell. The order stopped sale of the bonds under an agreement with a syndicate, since the pact expired July 1. The suit was to have been heard on June 26 but now on July 17 the court will hear the action brought by John Bayha, Aberdeen taxpayer, attacking validity of the purchase and issue of $3,350,000 in revenue bonds to finance it.

•

State Tax on Municipal Plants Fought in Court

Suit has been filed in the Ingham County Circuit Court in Lansing, Mich., by eighteen Michigan municipalities asking that an act of the 1939 Legislature imposing the state's 3 per cent sales tax on products of publicly owned utilities be declared unconstitutional.

Declaration of the suit sets forth that the eighteen municipalities operate either electric or gas plants and that some 350,000 customers would be affected by the addition of the tax to their bills.

•

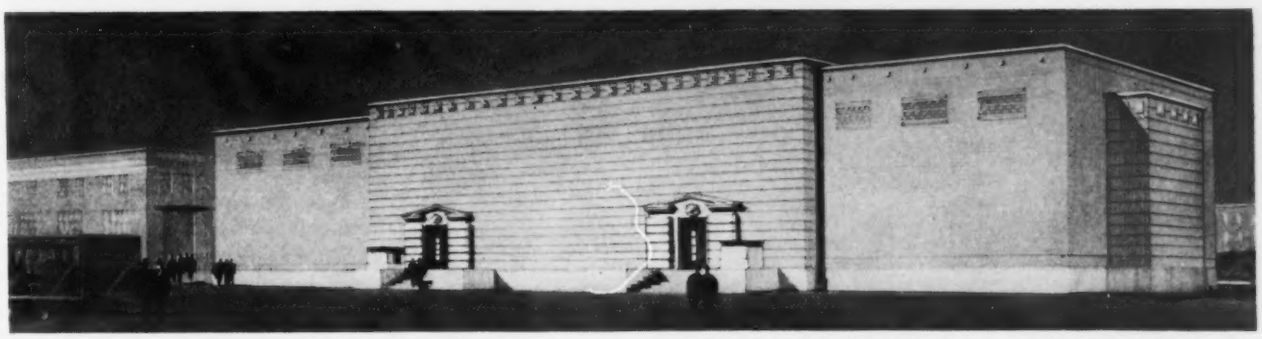
Oppose Boulder Revision

Objection has been raised by the director of the budget to the $50,000,000 reduction in return to the government involved in the bill for the revision of the power provisions of the Boulder Canyon Project Act proposed by the Colorado River basin states and Los Angeles.

•

Against California Project

Since he does not want a situation created in California like that existing in Nebraska, Secretary Harold L. Ickes did not give Frank W. Clark, California's director of public works, the sort of endorsement he went to Washington to secure for the proposed state power authority.



START WORK ON SWITCH HOUSE—Commonwealth Edison Co. began construction July 1 on switch house No. 2 at its Fisk station property. The new structure is to combine functions of a distribution station and switch house and will be isolated from other Fisk buildings. It will provide, in effect, another source of electricity supply for the growing load in the area served by Fisk and contribute to reliability of service in Chicago's loop district

Hits Range Service Accounts Practice

Brockton Edison's practice of putting residential service wires and fittings between the point of overhead attachment to the building and the meter into plant account has been unanimously rejected by the Massachusetts commission after a decade of experience in which the company expended $341,022 for this material and its installation.

The commission held that such outlays, although purposed to stimulate electric range market development by reducing first costs to the home occupant, partake more of merchandising activities than of capital investment. The board also raised the issue of possible discrimination against customers not having electric ranges, on the ground that if capitalization were allowed all residential customers would be obliged to help pay the resulting return on the rate base. It is expected that in the near future the accounting department of the commission will make a ruling as to the detailed handling of the above sum and future outlays of this kind.

The company's petition had been unanimously supported by the city wire inspector of Brockton, local union and electrical trade representatives. The board contended that many utilities in Massachusetts do not seek to capitalize outside services beyond the point of first attachment, and that its rules must apply uniformly rather than selectively.

•

Council Votes Contract for California Edison

The Los Angeles City Council has voted 14 to 1 to approve a contract effective July 1 whereby Southern California Edison will transfer to the municipally operated department of water and power certain fringe properties lying within the city limits. The Edison company is to receive, under the terms of the contract, operating properties outside the city limits proper valued at $1,078,000 and $4,494,000 in cash. The utility will transfer to the city upward of 50,000 meters and receive in return, aside from cash, some 9,000 customers.

•

Air Unit Systems Sold Increase 22% Over 1938

Central-plant air conditioning systems sold in Chicago in May set a new all-time high record, registering an increase of 22 per cent over the corresponding month of last year, according to figures released recently by Commonwealth Edison Co. Contracts were made for 77 air-conditioning installations with a combined capacity of 829 hp. This compares with 63 systems, totaling 549 hp., for May, 1938. A gain of 68 per cent in electric room cooler sales was also registered last month, the company reports. A total of 111 of these units were purchased by Chicagoans, compared with 66 in May, 1938.

•

Carolina Aluminum Denied Review

The United States Court of Appeals has denied the petition of the Carolina Aluminum Co. to review an order of the Federal Power Commission declaring that the "interests of interstate or foreign commerce" would be affected by the construction of the company's proposed dam and hydro-electric plant on the Yadkin River at Tuckertown, N. C.

The aluminum company on June 7, 1937, filed with the power commission a declaration of intention to construct the dam and power project on the Yadkin. The State of North Carolina intervened in the case, taking the position that the state, not the federal government had control over the Yadkin River.

On November 16, 1937, the power commission declared the river navigable and contended interstate commerce would be affected by construction of the dam. Last February the aluminum company sought a hearing in the Circuit Court of Appeals, and on June 6 the court ruled that it "was without power or jurisdiction to review the findings of the commission."

•

Requests Determination by FPC of Benefits

Southern California Edison Co. has filed an application with the Federal Power Commission requesting a determination of the equitable proportion of annual charges due the applicant from the San Joaquin Light & Power Co. for interest, maintenance and depreciation on its storage reservoir and other headwater improvements, because of the benefits received by the Kerckhoff plant of the San Joaquin Co., located on the San Joaquin River in California during the years 1937 and 1938, under Section 10(f) of the Federal Power Act.

•

Lets Concrete Contract

Contracts have been let for 3,432,500 barrels of cement for the Grand Coulee dam at an average cost delivered of $2.109.

Set Special Session for Federal Appeal

A special session of the United States Circuit Court of Appeals in Asheville, N. C., which adjourned recently, is slated for August 28 for the purpose of hearing the appeal of the United States government in the case of the Appalachian Electric Power Co. The case deals with a Federal Power Commission ruling on navigable streams. The question to be decided is: "When is a navigable stream not navigable?"

The power company contends it has a right to build power plants on certain streams, but the FPC contends these streams affect the navigation on other streams and are therefore in the same legal category as the streams on which boats bearing commerce and passengers ply.

The case was lost by the government in the district court and will be argued again in the circuit court in Asheville.

•

Recommends Second Brazos River Unit

Recommendation has been made to Congress by Major-General Julian L. Schley, Chief of Army Engineers, that an appropriation of $8,350,000 be made for construction of the Whitney Dam on the Brazos River as the second unit of the flood control and power project. The Possum Kingdom Dam, the first of the proposed thirteen dams of the project, is now under construction. The inclusion of the appropriation in the Omnibus rivers and harbors bill, pending now before the Senate, has been tentatively approved.

The project would include a power plant capable of generating 60,191,000 kw.-hr. annually. The power plant would add $1,800,000 to the initial cost of the project. The power could be sold for approximately $233,000 annually, according to the report. Annual maintenance costs of the flood control project was estimated at $30,000, with an additional $40,000 for maintenance of the power project.

•

Louisville Plea Denied

Federal Power Commission has denied the application of the Louisville Gas & Electric Co. filed June 5 for permission to defer completing and filing its statement of original cost of its electric utility plant. The commission's order stated that the plant includes two licensed projects, the hydro-electric generating plant on the Ohio River at Louisville and a transmission line.

Youngholm Says Lighting Market Can Be Quadrupled

Tells lighting experts only about 20 per cent as much light as good practice justifies is used today — Illuminating engineers gather at three-day event sponsored by Westinghouse

An ultimate lighting load of 90,000,000,000 kw.-hr. and total sales of a billion and a half lamps annually were foreseen by D. S. Youngholm, vice-president of the Westinghouse Electric & Manufacturing Company, keynote speaker at the Westinghouse Lighting Conference, sponsored by the lamp division, July 10-12.

Speaking before an audience of more than 120 lighting engineers and executives of the nation's leading electric utility companies at Bloomfield, N. J., Mr. Youngholm based his prediction on growth of the market during the last 50 years to its present volume—more than 500,000,000 lamps and 30,000,000,000 kw.-hr.—and an analysis of fertile fields for future expansion.

"In industry, on the basis of accepted practice in progressive manufacturing establishments, adequate lighting would add $60,000,000 to lamp sales and 15,000,000,000 kw.-hr. to load," he said. "To illuminate our retail stores to equal the lighting of the more up-to-date establishments would require $35,000,000 in additional lamps and 15,000,000,000 kw.-hr.

Home Needs Cited

"Schools and offices adequately lighted would require tripling present illumination and would add $30,000,000 to lamp sales and 5,000,000,000 kw.-hr. to load. In homes a load of 15,000,000,000 kw.-hr. and $50,000,000 in lamps could be added. Adequate lighting of only the more important streets and arterial highways would add $20,000,000 to lamp sales and 1,500,000,000 kw.-hr. to load and, it is estimated, would save 8,000 lives annually. About 250,000 farms being added to utility lines yearly become prospects for 'Better Light—Better Sight.'"

A. E. Snyder, sales manager of the Westinghouse Lamp Division, was chairman of the first day's conference, held at the Bloomfield, N. J., works. Mr. Snyder discussed briefly the needs and problems of the lighting business and introduced the speakers. Harry D. Madden, manager of lamp manufacturing, traced manufacturing problems and processes. R. R. Brady, A. B. McKenna and C. S. Woodside described new incandescent, vapor and fluorescent light sources. O. P. Cleaver, Westinghouse commercial engineer, delved into the opportunities for creating new lighting loads. E. W. Beggs, assistant manager of commercial engineering, conducted a question-and-answer session at which conferees asked questions of lamp division experts in the various fields of illumination.

A conference meeting on July 11 was held at the New York Electrical and Gas Association headquarters, New York, with D. W. Atwater, manager of commercial engineering for the lamp division and national president of the Illuminating Engineering Society, as chairman.

A. Frankel, manager of the lamp division's special products sales department, told of load-building opportunities in lamps used for the production of radiations other than light, such as bactericidal lamps, electronic devices and steam generator lamps.

E. R. Sherbaum, electrical engineer for the New Jersey State Highway Department, told how adequate lighting on highways in sixteen New Jersey counties has reduced night deaths from accidents by 37 per cent, at a cost to taxpayers of about $500 per life saved.

H. M. Sharp, manager of the lighting bureau, Buffalo, Niagara & Eastern Power Corp., Buffalo, N. Y., discussed the practical side of fluorescent lighting, and H. E. Plishker, manager of advertising and sales promotion for the lamp division, told of his company's lighting promotion plans.

Mr. Atwater conducted a symposium in which successful sales activities were reported by G. W. Ousler, Duquesne Light Co., Pittsburgh, Pa.; O. R. Hogue, Commonwealth Edison Co., Chicago; F. S. Dewey, Cincinnati Gas & Electric Co., Cincinnati; O. M. Jackson, Georgia Power Co., Atlanta; H. C. Clum, Jersey Central Power & Light Co., Asbury Park, N. J., and W. T. Blackwell, Public Service Electric & Gas Co., Newark, N. J.

Miss Myrtle Fahsbender, home lighting specialist for the lamp division, traced opportunities in home lighting. J. E. North, director of domestic sales for the Cleveland Electric Illuminating Co., and chairman of the national Better Light—Better Sight Bureau, revealed plans of the bureau for the future.

Sessions Held at Fair

Mr. Cleaver was chairman of the meeting July 12, held at the Westinghouse Building, New York World's Fair. Speakers were S. G. Hibben, director of applied lighting for the lamp division, who told how the greatest spectacle of light in history was created at the fair, and E. H. Sniffen, director of the Westinghouse exhibit, who discussed his company's part in the fair. Inspection of night lighting at the fair concluded the conference.

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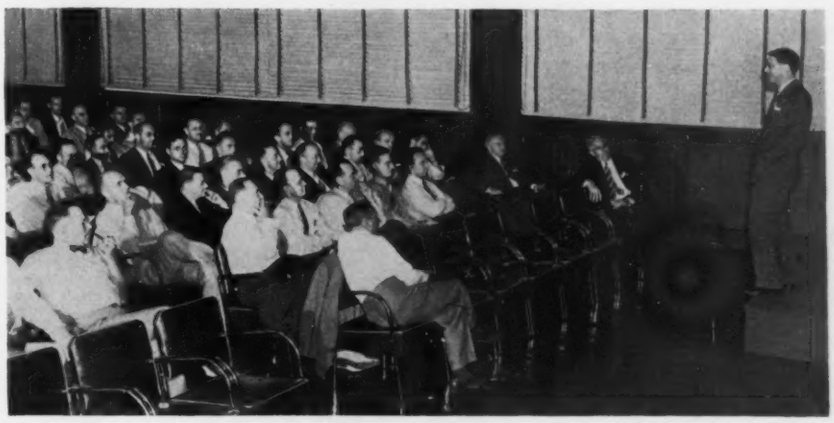
Light-Power Valuations Up

Figures released on utility valuations by the Washington State Tax Commission for the year 1939 show in the light and power division an increase of $1,974,540 over 1938.



CREATING NEW LIGHTING LOADS—O. P. Cleaver, commercial engineer for the Westinghouse lamp division, is pictured addressing the Westinghouse Lighting Conference on "Creating New Lighting Loads" at the lamp division's Bloomfield, N. J., works July 10. More than 120 lighting engineers and executives of the nation's leading electric utility companies attended the three-day conference, July 10-12. Sessions on July 11 were held at the New York Electrical and Gas Association headquarters and on July 12 at the Westinghouse Building, New York World's Fair

Tells Paris Group of Lighting Tests

Transmission lines and stations can now be built in the United States virtually lightning-proof, P. L. Bellaschi, research engineer, Westinghouse Electric & Manufacturing Co., told the International Conference on Large Electric High-Tension Systems at its meeting in Paris.

Mr. Bellaschi, in discussing the various improvements made in power apparatus, stated that the "impulse characteristics of most line and station insulators have been established on a quantitative basis, suitable for application to the station design." He declared that the extensive experience in impulse testing several million kva. of transformers and other station apparatus has contributed in a large measure to evaluate the basic requirements and also essential details that must be fulfilled to secure coordination and protection.

It was pointed out by Mr. Bellaschi that the lightning arrester has been the object of additional experimental verification and of further improvement in its two-fold function to provide protection of the station apparatus against damage and protection of service against outage.

•

N.I.A.A. Conference to Be Held in Fall

National Industrial Advertisers Association is planning a national conference to be held in New York, September 20–22, at the Hotel New Yorker, under the sponsorship of the Technical Publicity Association of New York and the Industrial Marketers of New Jersey.

Executives and advertising men representing hundreds of American and Canadian industries will attend. Stress will be laid on industrial marketing. The program will consist of general sessions and a series of eleven "clinics." At the general sessions outstanding speakers will discuss phases of industrial marketing that are of special importance today. In the clinics problems in industrial marketing, submitted by N.I.A.A. members themselves, will be analyzed by experts.

A display of industrial advertising and an exhibit of supplies and services of interest to industrial advertisers will be features of the conference.

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Rates to Co-Ops Reduced

Reduction of approximately 26 per cent in wholesale power rates to electric co-operatives served by the Arkansas Power & Light Co. has been ordered by the State Utilities Commission, effective July 1. The new rate will average between 0.87 and 0.91 cent per kilowatt-hour. The present rate is 1.23 cents. Arkansas Power & Light Co. now serves six of the seven rural electrification co-operatives in its territory and the commission said the new rates would be available to similar organizations formed under Act 342 of 1937 to sell retail electric service in rural areas.

•

FPC Chairman Elected

Commissioner Clyde L. Seavey was elected chairman of the Federal Power Commission when that body met last week with a full membership for the first time since October 1, 1937. Mr. Seavey succeeds Frank R. McNinch, who resigned in 1937. Claude L. Draper of Wyoming was elected vice-chairman. The meeting was called after Leland M. Olds of New York was sworn in as a member of the commission to succeed Mr. McNinch.

MEETINGS

American Transit Association—Annual convention, Los Angeles, Calif., August 10-11; San Francisco, August 14-15. Charles Gordon, managing director, 292 Madison Av., New York, N. Y.

International Association of Electrical Inspectors—Joint annual meeting, northwestern and southwestern sections, Hotel Empire, San Francisco, Calif., August 14-18; western section, Hamilton, Ont., September 11-15; southern section, Asheville, N. C., September 18-22.

Illuminating Engineering Society—Annual meeting, Fairmont Hotel, San Francisco, Calif., August 21-25, Howard M. Sharp, general secretary, 51 Madison Avenue, New York, N. Y.

National Association of Railroad and Utilities Commissioners — Annual meeting, Seattle, Wash., August 22-25. Clyde S. Bailey, secretary, New Post Office Bldg., 12th and Pennsylvania Avenue, Washington, D. C.

Maryland Utilities Association—Annual fall convention, George Washington Hotel, Ocean City, Md., August 25-26. J. H. Purdy, secretary, Lexington Building, Baltimore, Md.

Rocky Mountain Electrical League—Annual convention, Estes Park, Colo., September 7-9. George E. Lewis, manager, Gas and Electric Bldg., Denver, Colo.

Electrochemical Society—Fall convention, Hotel Commodore, New York, N. Y., September 11-13. Dr. Colin G. Fink, secretary, Columbia University, New York, N. Y.

Wisconsin Utilities Association—Annual convention, accounting section, Plankinton Hotel, Milwaukee, Wis., September 21-22; electric section, commercial and technical divisions, November 6-7, Schroeder Hotel, Milwaukee. A. F. Herwig, executive secretary, Room 502, Brumder Bldg., 135 West Wells St., Milwaukee, Wis.

National Industrial Advertising Association—National conference, Hotel New Yorker, New York, N. Y., September 20-22. William H. Easton, chairman, publicity committee, 420 Lexington Av., New York, N. Y.

American Institute of Electrical Engineers—Great Lakes district, Minneapolis, Minn., September 27-29. H. H. Henline, national secretary, 33 West 39th St., New York, N. Y.

Indiana Electric Association—Annual convention, French Lick, Ind., September 28-30. Tom C. Polk, secretary, 607 Traction Terminal Bldg., Indianapolis, Ind.

New Mexico Slated to Have State Body

At the next session of the New Mexico Legislature it is expected to pass bills for the regulation of private utility companies in the state. Arthur Prager, general manager of the Albuquerque Gas & Electric Co., declared that he has no objection to regulation that will be fair to the companies and the consumers.

Utility regulation was opposed in the last session because of the proposals made. It is now felt that needed corrections have been made. A state utility agency was suggested by Robert Valdez, state corporation commissioner. He suggested that the body be nonpolitical, and should include a utility member.

•

Will Hold 1939 Machine Tool Show in Cleveland

A 1939 Machine Tool Show, to be held in Cleveland October 4 to 13, has been announced by the National Machine Tool Builders Association. Both in number and range of exhibits and in improvements in performance and design of machine tools this year's show is expected far to surpass the last Machine Tool Show, which was held in Cleveland in 1935. The show will be housed in Cleveland's $15,000,000 Public Auditorium.

Manufacturers from all over the United States and from many foreign countries are expected to visit the show. "The last four years have shown substantial advances in the art of machine tool building—advances which mean reduced production costs, increased productivity per dollar invested and greater potential profits," said Wendell E. Whipp, president of the National Machine Tool Building Association and president of the Monarch Machine Tool Co., Sidney, Ohio.

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Visit Wiring Exhibit

More than 35,000 persons visited the adequate wiring display at the recent home show of the New Orleans Real Estate Board. The booth was sponsored by the Electrical Association of New Orleans, Inc., and New Orleans Public Service.

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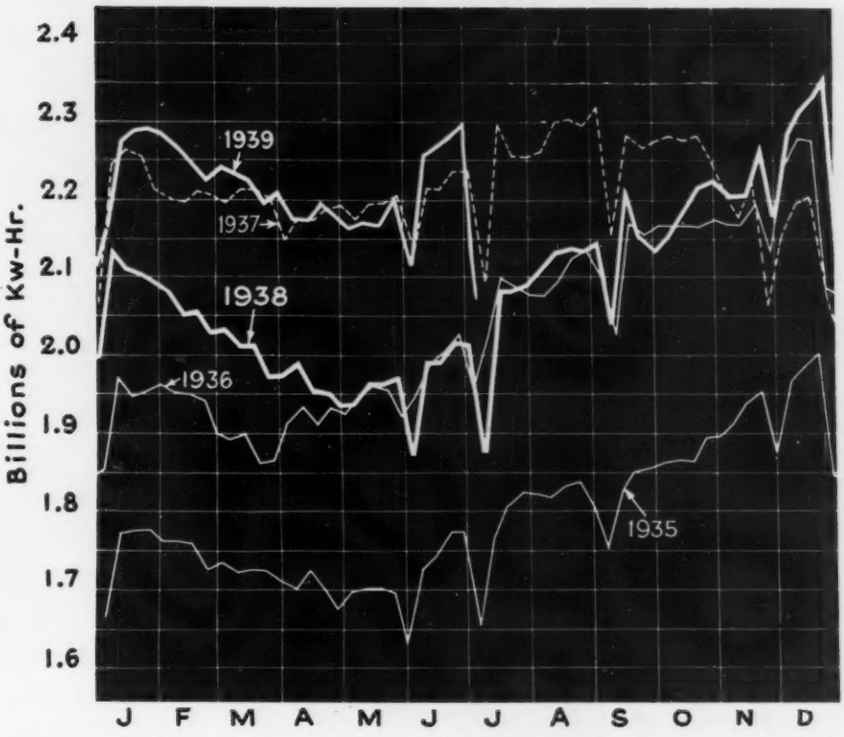
Georgia Power Lamp Sales

Mazda lamp sales of Georgia Power Company during the first six months of 1939 totaled 259,063 units, or 107.61 per cent of quota. I.E.S. lamp sales during the same period were 2,946 units, or 77.53 per cent of quota.

Output Dips in Week of Holiday

As is always the case in the week that includes Independence Day, the output of the electric light and power industry in the week of July 8 registered a sharp decline from the preceding record-breaking maximum for any July week. As reported by the Edison Electric Institute it amounted to 2,077,956,000 kw.-hr., which was 10.5 per cent higher than in the corresponding period a year ago, but 0.9 per cent less than in 1937.

The unusually large dip would seem to indicate the rather general observance of a double holiday, including Monday as well as Tuesday, leaving an exceptionally short working week, which, of course, is reflected in the figures for energy consumption. In 1938 the holiday fell on a Monday and in 1937 on a Sunday. The result was felt in all regions except the Middle Atlantic, where the percentage over 1938 actually increased slightly. As before, the largest gains over a year ago were reported in the Mountain and Central Industrial areas.



Weekly Output, Millions Kw.-Hr.

1939		1938		1937	
July 8	2,078	July 9	1,881	July 10	2,096
July 1	2,300	July 2	2,015	July 3	2,238
June 24	2,285	June 25	2,019	June 26	2,238
June 17	2,265	June 18	1,991	June 19	2,214
June 10	2,257	June 11	1,992	June 12	2,214
June 3	2,114	June 4	1,879	June 5	2,131

Per Cent Change from Previous Year

Region	Week Ending July 8	July 1	June 24
New England	+ 9.3	+13.4	+12.2
Middle Atlantic	+11.6	+11.3	+10.3
Central Industrial	+13.6	+17.7	+16.1
West Central	+ 4.3	+ 5.9	+ 3.4
Southern States	+ 8.4	+13.7	+13.9
Rocky Mountain	+15.8	+19.2	+20.5
Pacific	+ 7.6	+11.5	+10.3
United States	+10.5	+14.2	+13.2

Rural Allotments Total $2,774,000

Rural Electrification Administration has announced allotments totaling $2,774,000 for 48 projects in 24 states. Among the allotments are the following:

ALABAMA—Dixie Electric Membership Corp., Union Springs, Albert M. Redd, supt., $107,000 to build 137 miles of line, 480 members in Bullock, Montgomery, Tallapoosa, Lowndes, Macon and Lee counties.

ARIZONA—Sulphur Springs Valley Electric Co-op., Willcox, R. R. Harbour, president, $120,000 for construction of a generating plant.

ARKANSAS—Arkansas Power & Light Co., Pine Bluff, Harvey Couch, president, $200,000 to build 250 miles of line, 1,000 customers in Columbia, Ouachita, Nevada, Dallas, Clark, Montgomery, Calhoun, Garland, Saline, Conway, White, Monroe, Faulkner, Izard, Stone, Pope, Yell, Perry, Pulaski, Grant, Jefferson, Dresha and Drew counties. Co-operative being formed, Paul Carruth, Camden, correspondent, $126,000 to build 145 miles of line, 447 members in Ouachita, Calhoun and Dallas Counties.

GEORGIA—Hart County Electric Membership Assn., Hartwell, George Bell, supt., $162,000 to build 219 miles of line, 860 members in Hart, Elbert, Franklin and Stephen counties. The Little Ocmulgee Electric Membership Corp., Alamo, Ga., J. W. Simmons, Jr., supt., $90,000 to build 107 miles of line, 392 members in Telfair, Laurens and Wheeler counties.

Among the allotments made last month were the following:

CALIFORNIA—Surprise Valley Electrification Corp., E. G. Keffer, manager, Alturas, $122,000 to build 69 miles of line, 129 members in Modoc and Lassen counties.

FLORIDA—Clay County Electric Co-op. Assn., Inc., Copeland S. James, supt., Keystone Heights, $38,000 for addition to existing generating plant. Suwannee Valley Electric Co-op. Assn., Inc., M. L. Smith, president, Maho, $127,000 to build 151 miles of line, 452 members in Suwannee and Lafayette counties.

MARYLAND — Southern Maryland Tri-County Co-op Assn., Inc., Forrest Coakley, manager, LaPlata, $160,000 of which $105,000 will be used to build 100 miles of line, 338 members in St. Marys, Prince Georges and Charles counties, and the remaining $55,000 will be used for an addition to the existing generating plant.

MISSOURI — New-Mac Electric Co-op., Inc., W. H. Higginbotham, president, Neosho, $299,000 to build 318 miles of line, 974 members in Newton and McDonald counties.

NORTH DAKOTA—Baker Electric Co-op., Inc., Palmer Stadum, supt.. Baker, $117,000 to build 134 miles of line, 309 members in Benson, Wells, Towner and Rollette counties.

PENNSYLVANIA—Bedford Rural Electric Co-op., Inc., H. L. Cline, president, Everett, $250,000 to build 210 miles of line, 862 members in Bedford and Somerset counties.

SOUTH CAROLINA—Lynches River Electric Co-op., Inc.. Frank Blackwell, president, Pageland, $220,000 to build 230 miles of line, 1,025 members in Lancaster, Chesterfield and Kershaw counties.

SOUTH DAKOTA—Lincoln Union Electric Co., Harold S. Swanson, supt., Alcester, $111,500 to build 99 miles of line, 271 members in Lincoln County.

Power Plant in England Sells Its Powdered Ash

The use of powdered ash from the steam-driven generating station at Leicester, England, for the manufacture of concrete, will save the corporation several thousands of dollars a year.

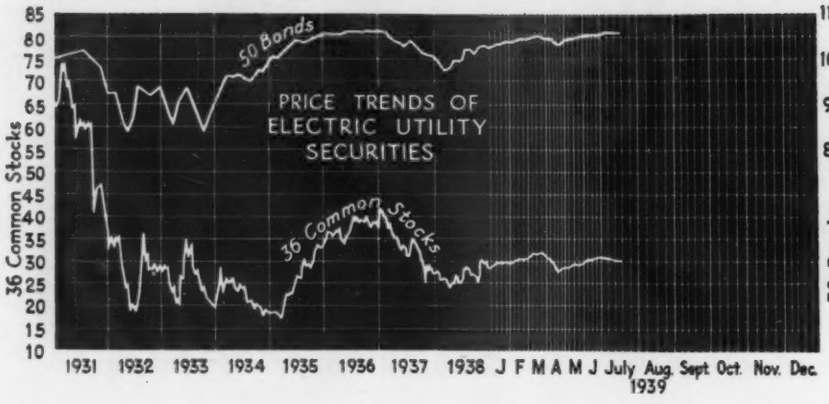
The Electricity Committee of the city has made arrangements with Vitreous Concrete, Ltd., which will take between 15,000 and 30,000 tons of the powdered ash for the manufacture of concrete pipes and a new kind of brick. The ash will be sold at 75 cents a ton, as compared with the present cost of $1.50 a ton to have it removed.

•

Protests Appropriation Cut

James C. Bonbright, chairman of the Power Authority of the State of New York in a letter to Speaker Heck and Majority Leader Hanley of the State Legislature strongly protested the 40 per cent cut in the Authority's appropriation for the next fiscal year. Dr. Bonbright pointed out that the reduction in the Power Authority's appropriation from the $85,000 allowed by Governor Lehman to $50,000, while only an insignificant saving, would seriously cripple the Authority's work.

Utility Issues Gain in Week


50 Bonds
PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
36 Common Stocks
36 Common Stocks
50 Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
1931 1932 1933 1934 1935 1936 1937 1938 J F M A M J July Aug. Sept. Oct. Nov. Dec. 1939

Utility issues led the advance of securities on last Tuesday; for the week, the "Electrical World" index of electric power and light common stocks was up 0.6 point to 30.6; index for a year ago this week, 27.8. Bond index also gained, rising 0.3 point to 105.7

SEC Denies Utility Plea for Exemption

SEC has ruled that the Union Electric Co. of Missouri is a holding company subject to the jurisdiction of the commission. In a precedent-making opinion the commission declined to grant the company's application for exemption from the Utility Holding Company Act, rejecting its plea that it should not be subject to the act, since it was a subsidiary of the North American Co., a registered holding company. Commissioner George C. Matthews dissented. Commissioner Leon Henderson did not participate.

The company had argued that as a subsidiary of the North American Co. it was already subject to most of the regulatory provisions of the act. On this point the commission ruled:

"The mere fact that the applicant may now be subject to many of the sections of the act does not empower us to grant it an exemption as a holding company unless it comes within those provisions authorizing us to grant exemptions . . ."

•

Public Service Dividend

Directors of Public Service Corp. of New Jersey have declared a quarterly dividend of 65 cents a share on the common stock, or 5 cents more than the last declaration. The dividend is payable September 30 to stockholders of record September 1.

•

West Penn to Call Stock

West Penn Power Co. has notified holders of its 6 and 7 per cent preferred stocks that their shares will be redeemed February 1, 1940, if the proposed plan to issue new 4½ per cent preferred stock is effected upon approval of the SEC.

•

Bond & Share Units to Shift Service

Ebasco Services, Inc., and Ebasco International Corp. has filed with the SEC applications under the holding company act in connection with a plan of segregating the foreign and domestic service business presently carried on by Ebasco Services, Inc.

Application of the two service companies states that it is proposed to transfer the assets of Ebasco Services, Inc., used in its foreign business to Ebasco International Corp. The transaction, in effect, it is stated, involves the transfer of certain property and assets from one branch of a service organization to another.

In consideration of the transfer of the property and assets, Ebasco International Corp. will issue 6,990 shares of its capital stock to Ebasco Services, Inc., which, together with ten shares now held by that company, represent all the capital stock of Ebasco International Corp. The 7,000 shares of capital stock then will be transferred to Electric Bond & Share, which will surrender a like number of shares of capital stock of Ebasco Services for cancellation.

Ebasco International proposes to perform technical, supervisory and other services for public utility and other client companies operating in South America, Central America, Cuba, China, India, Mexico and Panama, which are now being carried on by Ebasco Services. Ebasco Services also filed an application for approval of the acquisition of the entire business, property and assets of the Phoenix Engineering Corp., a wholly owned subsidiary. The proposed acquisition contemplates the complete liquidation and dissolution of Phoenix Engineering Corp.

•

Subsidiaries Sold by Associated Gas

Sale of a number of operating properties of Associated Gas & Electric Co. was revealed by the company this week, including most of the Tennessee properties of the Kentucky-Tennessee Light & Power Co. These were sold either to TVA or to the communities served, the company stated, and included water services as well as electric properties. With the sales in Tennessee, Associated's interest in that state now is limited to the area around Jellico and two small rural areas.

Other properties sold were Southern Ice Co., Inc., to private interests in Atlanta, Ga.; Tucumcari (N. M.) Light & Power Co.; Loogootes (Ind.) Water Co. and Rising Sun (Ind.) Water & Light Co. In the case of Tucumcari Light, the properties were bought outright by the city of Tucumcari to be operated on a public power basis at a price of $400,000.

Commenting on the program of integrating operations, Associated said: "The Associated system has continued its program of eliminating companies whose corporate existence has served its purpose. Fourteen of these companies were eliminated in 1938 and three thus far in 1939. This brings to a total of 368 the companies eliminated since 1922 by this program through merger, consolidation or dissolution.

•

Allowed to Split Common

Otter Tail Power Co. has been authorized by the FPC to split its no-par value common stock four for one and to fix a par value for the split stock.

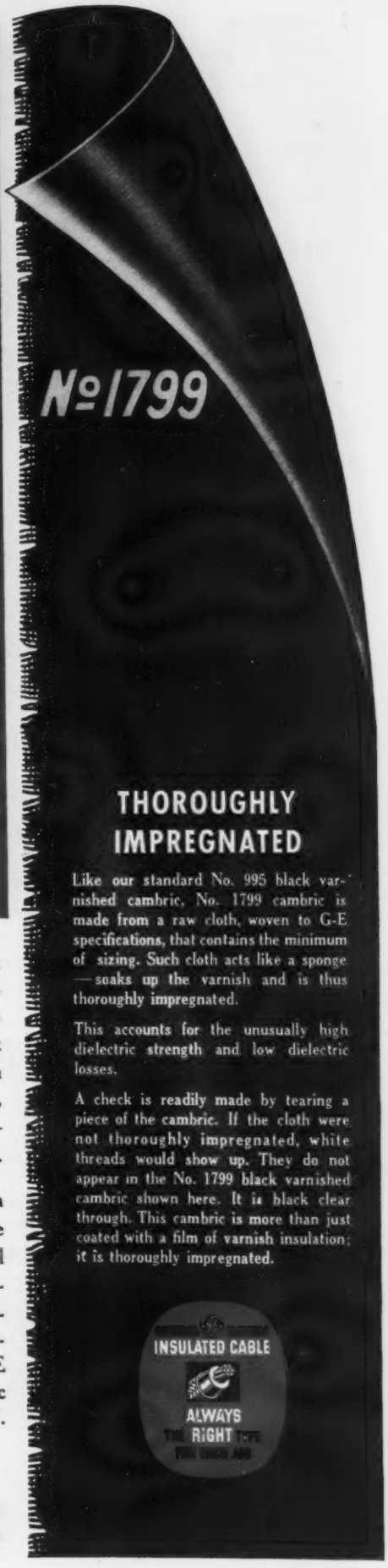
Utility Reports

	Net Income 1939	1938
*Carolina Pwr. & Lt.	$2,454,422	$2,436,394
*Central Maine Pwr.	1,891,715	1,633,825
*Cons. G.E.L.&P. (Balt.) and sub.	6,156,605	6,069,698
*Engineers Pub. Serv. and subs.	4,755,100	3,650,811
*Houston Ltg. & Pwr.	3,064,647	2,872,241
*Memphis Pwr. & Lt.	1,440,755	1,890,305
*Nebraska Pwr.	1,869,446	1,910,628
*Nevada-California Elec. and subs.	440,454	662,812
*New Orleans Pub. Serv.	1,667,155	1,153,540
*Texas Pwr. & Lt.	1,931,498	2,362,700
*Utah Pwr. & Lt. and subs.	1,529,094	1,469,923
*Wisconsin Pub. Serv. and sub.	1,537,461	1,250,124

* Twelve months ended May 31.

Now G-E Insulated Cable with a NEW Heat-Resisting Varnished Cambric

Having HIGH DIELECTRIC STRENGTH LOW DIELECTRIC LOSSES



THOROUGHLY IMPREGNATED

Like our standard No. 995 black varnished cambric, No. 1799 cambric is made from a raw cloth, woven to G-E specifications, that contains the minimum of sizing. Such cloth acts like a sponge—soaks up the varnish and is thus thoroughly impregnated.

This accounts for the unusually high dielectric strength and low dielectric losses.

A check is readily made by tearing a piece of the cambric. If the cloth were not thoroughly impregnated, white threads would show up. They do not appear in the No. 1799 black varnished cambric shown here. It is black clear through. This cambric is more than just coated with a film of varnish insulation; it is thoroughly impregnated.

No. 1799 is a new G-E black varnished-cambric insulation.

It has the same high dielectric strength and the same low dielectric losses as our standard No. 995 black varnished cambric.

But—and this is the important feature—it has added heat resistance; cable insulated with No. 1799 cambric can be run at a conductor temperature of approximately 10 degrees (C) higher.

The use of No. 1799, therefore, should result in savings—savings in copper, in over-all diameter, in duct space, in first cost, and in other ways that mean dollars and cents.

We consider No. 1799 an important development—probably the outstanding development in varnished-cambric cable in all the thirty-eight years that General Electric has been making this type. We think, therefore, that you'd like to know more about it—and about the savings it makes possible.

If you have a job at hand for which you think this new cable would be suited, a G-E cable specialist will be glad to give you complete information and prices as well as any technical assistance you may desire. Address the nearest G-E sales office, or General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC

5B9-177

OPERATING PRACTICES

Selector Scheme Speeds Ground Test

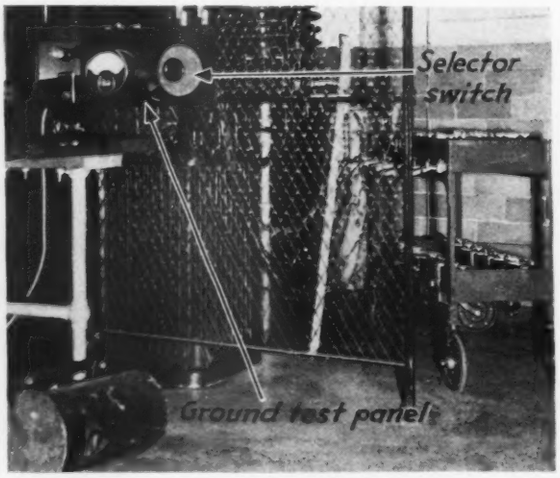
A few minor additions to the high-voltage test cage at the meter department of the Central Illinois Public Service Company, Springfield, has fitted it for rapid ground testing of watt-hour meters. The installation makes it possible to ground check twelve meters simultaneously by merely turning a selector switch on the test panel.

A potential of 1,150 volts, supplied from a regular 115/1,150-volt potential transformer, is impressed across the meter insulation from conductor to case. One leg of the 1,150-volt circuit is attached to the metal frame of a cart holding the meters to be tested. Twelve leads are attached to the "hot" leg of the transformer through a twelve-point selector switch. The switch allows successive leads to be connected directly to the transformer. Each lead is provided at its outer end with a pronged adapter for insertion in both line terminals of the meter.

The test is made by the operator standing at a panel outside the test cage. From this point the primary of the potential transformer is energized.

The operator next closes the high-voltage secondary circuit with one hand, at the same time turning the selector switch connecting successive meters across the high voltage supply.

Deflection of a milliammeter in the transformer primary circuit at any of the selector switches' twelve positions indicates a ground on the corresponding meter. A Neon glow lamp on the control panel also indicates when the transformer is energized.



Check meters for grounds quickly

Selector switch in 115/1,150-volt potential transformer subjects meters on cart to high voltage in rapid succession. Deflection of meter at any switch position indicates ground in meter concerned. For safety, operator must stand outside cage. Both hands are occupied with the test.

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Ladder Truck Aids Light Maintenance

By KENNETH REID
Electrical Engineer
Victoria City Light Dept., B. C.

Recent modernization of residential street lighting at Victoria, on Vancouver Island, B. C., resulted in the installation of 200 and 300-watt incandescent lamps with filament cutouts, permanently mounted. Although such units require only occasional maintenance, the Department confronted the need of some type of ladder equipment, inasmuch as the previous magnetite arc lamps had been serviced by lowering to ground level.

This simple extension ladder used by Victoria City Light Department can be operated by one man and the mount is easily transferred from truck to truck

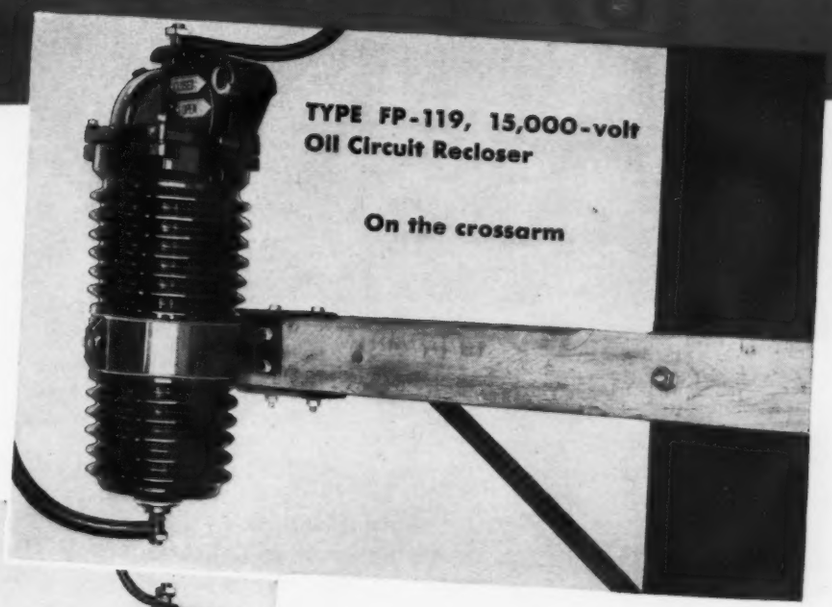
Accordingly, a light ladder unit was designed by the Department and constructed in City shops, where it was mounted on a ¾-ton service truck. The ladder consists of two 14¾-ft. sections, built on the conventional extension principle and provided with suitable bracing to carry the load.

At maximum vertical position it extends 31 ft. above ground. At a point 3½ ft. from its lower end it is supported on pivots and carried by a turntable. Counterweights at its lower end facilitate erection and permit operation by one attendant. The unit can be locked in many positions through 360 deg. of traverse and elevations from 30 deg. to vertical.

[*Continued on page 66*]

It's AMAZING

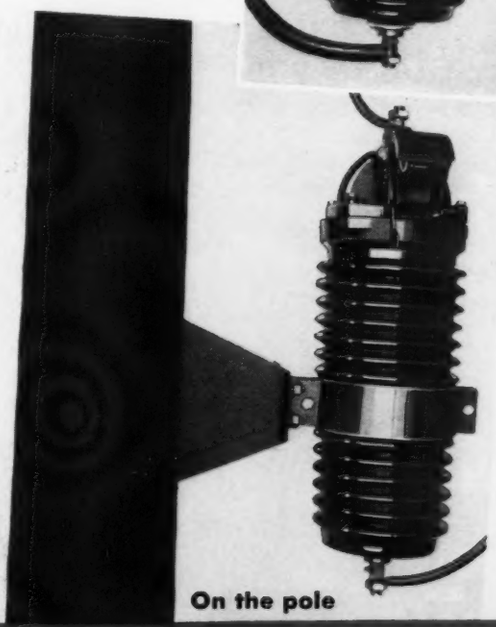
—the amount of trouble *and money* this little device* can save you!



TYPE FP-119, 15,000-volt Oil Circuit Recloser

On the crossarm

*THIS 15,000-volt automatic recloser brings to low-revenue lines protection previously obtainable only with large automatic reclosing circuit breakers.



On the pole

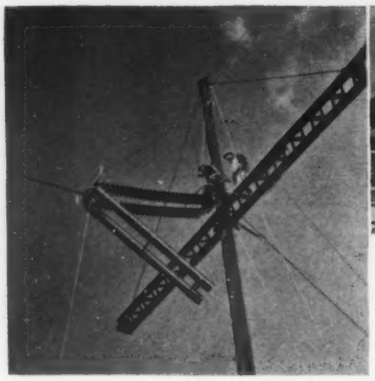
THIS G-E recloser saves your maintenance crew a lot of trips by resetting automatically and restoring service, if the fault is transient—and most of them are. If the fault persists, it recloses three times at 3-second intervals and then, if the fault is still there, it opens and locks open—to be hand reset.

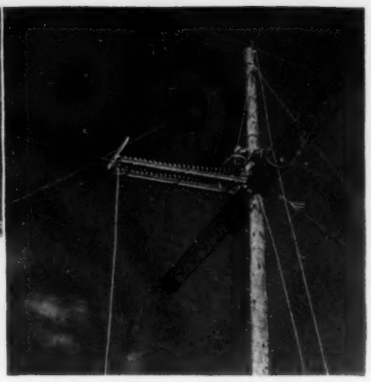
Ideal for low-cost protection on suburban and rural lines. Five ratings: 3, 6, 12, 25, and 50 amperes. Ratings easily changed in the field.

Learn more about its six money-saving features —in Bulletin GEA-2846, sent on request. General Electric Company, Schenectady, N. Y.

SEE THE HOUSE OF MAGIC

GENERAL ELECTRIC





When not in use, it is supported in a cradle over the roof of the truck cab and is provided with a lock to prevent movement during transit. Ladder and mount constitute a complete unit, which is bolted to the floor of the truck and can be quickly removed.

•

Trough Holds Dead-End String During Repair

For repairing dead-end insulators and hardware on the 287-kv. line from Boulder Dam, engineers of the Los Angeles Bureau of Power and Light have devised a double trough of duralumin weighing only 48 lb. It is used to support the 900 lb. of insulators in a standard assembly, plus the weight of the mechanic working on the unit, as well as to hold the normal 4,600-lb. tension of a conductor span. This unit is designed for handling by a two-man crew.

Duralumin dead-end trough
These pictures show the trough being raised and engaged in place preparatory to work on the dead-end.

For safety of life and limb
Parachute type harness, attached to heavy line, worn by mechanics when working on dead-end insulators.

Hooks at the end of the trough are designed to engage the conductor support at the end of the dead-end string. By means of hand lines, two men working on the tower cross arm raise the trough until these hooks engage. The end toward the tower is then raised to position, and as conductor tension is eased off tension is transferred to the duralumin unit and the insulator assemblies come to rest in the twin cradles. Individual insulators are then easily interchangeable, one man accomplishing this by standing on one cradle and working on the string in the opposite one.

Parachute Type Harness

For safety in this job the mechanic is required to wear a parachute type harness, adapted from oil-field use. The harness consists of webbed straps that fit closely around the body to distribute the shock of being brought to from a fall. A sling is formed between the crotch, over the shoulders and up the back of the neck. It is governed by a D-ring above the head. The ring is attached to a $\frac{1}{4}$-in. steel cable, inside a 1-in., four-strand cotton rope, which, at its other end, is fixed to the tower at a location which will permit the man to swing free should he fall. An important advantage of the harness is that its design will permit free movement of arms and legs while working on the insulator assembly.

Machine Stamps Meter Tags

Before service building employees of the Buffalo Niagara Electric Corporation built this stamping machine metal meter tags were stamped by hand, a slow and laborious process.

Weatherproof Wire and Cable*

Kansas City Power & Light Specifications

III—Tests for Wire and Cable

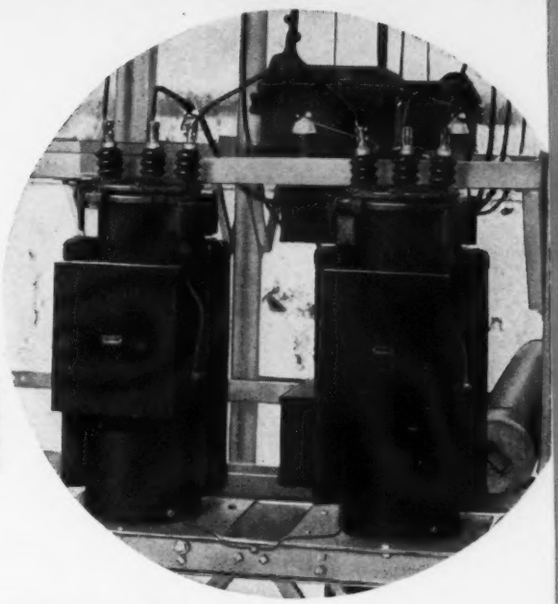
Tests shall be run on samples from not less than three packages of each size of wire in the shipment and on each package if less than three. In case of failure of two of these samples the shipment shall be rejected. In case of failure of one of these samples to meet the specification all of that size of wire in the shipment shall be con-

*The third of a series of five covering specifications to get single-conductor wire and cable that can be installed throughout the year and which will give reasonably long service.

Set 60 Poles Daily With Tractor Unit

Sixty poles a day were set by the Illinois Northern Utilities Company near Morris, Ill., using a Caterpillar 22 with Highway post-hole digger. Tractor consumes 8 to 10 gal. of gasoline per 6½-hour day on this work.

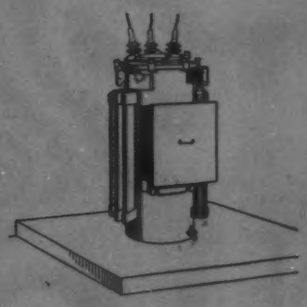
Look What You Can Do with This NEW Low-cost G-E Induction Voltage Regulator



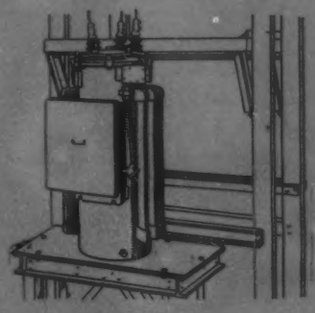
Here are Type BIRS regulators installed on a branch circuit of a New York State utility

TYPE BIRS
Single-phase, 60 cycles
2400-v, for 50- and 100-amp
4800-v, 25- and 50-amp

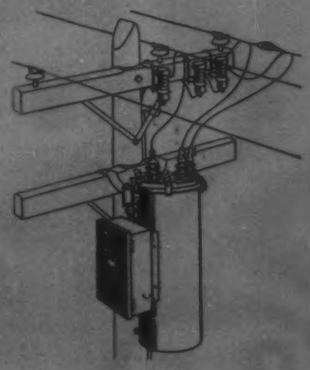
Install it indoors or outdoors at the station



For floor mounting



Or platform mounting



For crossarm mounting on branch feeders

THIS new Type BIRS induction voltage regulator supplements our improved Type IRS regulator, which we announced last fall. Like the improved IRS, this smaller brother can be installed indoors or outdoors at stations; but, in addition, it can also be pole-mounted for maintaining smooth, close, and dependable regulation on small individual feeders and branch circuits of larger feeders.

By comparison with previous designs, our new Type BIRS regulator

Costs Less to Install

1. Same unit suitable for floor, platform, or crossarm mounting.
2. Only three line connections to make.
3. Cover bushings with clamp-type solderless connectors simplify line connection.
4. Regulator shipped oil-filled, ready for installation.

Costs Less to Inspect

1. Detachable control cabinet can be mounted at base of pole.
2. Control cabinet can be mounted 90 degrees from pole for ready inspection.
3. Hinged control panel can be swung out for ready access to back connections.

Costs Less to Maintain

1. Motor stops quickly without use of a brake.
2. Small amount of current required by motor-control relay greatly reduces voltmeter contact duty.
3. Continued quiet operation.

We think you will welcome this newest addition to our family of regulators. Its development is a continuation of our policy of giving you more economical, flexible, and dependable regulating devices for every part of your system. Ask your G-E representative for publication GEA-2018C or write General Electric Company, Dept. 6—201, Schenectady, N. Y.

GENERAL ELECTRIC

sidered in question and shall be decided for acceptance or rejection on the basis of either additional samples or the correction of the failure by the factory.

Additional samples shall consist of three more selected at random from other packages of the shipment. If any of the samples in this second lot show the same failure as in the first lot the shipment shall be rejected subject to correction of the fault by the factory. In deciding on the basis of additional samples, any item that may be considered as a basis for adjustment or group rejection shall be decided on the basis of the average of all samples taken.

The samples shall be cut from the end of different coils or reels obtained after cutting back at least 2 ft. from the end of the reel or coil. In general, it is desirable to have the piece or pieces straight or in the original coil size, avoiding bending as far as possible.

Sample lengths necessary for different tests:

Strength and elongation:	
bare solid conductor	2 ft.
bare stranded conductor	3 ft.
insulated conductor	3 ft. 6 in.
Weight analysis	2 ft.
Melting test	6 in.
Dripping test	6 in.
Absorption of water	4 in.
Cold temperature bending test	1 ft. 6 in.
Room temperature bending test	1 ft. 6 in.
Total for solid wire 12 ft.; for stranded wire 13 ft.	

Absorption Test—A 4-in. sample of the finished weatherproof wire, with ends waxed by dipping in hot paraffin or wax, shall be submerged in fresh water at 70 deg. F. for 24 hours, and shall not absorb more than 3 per cent of the weight of the covering. The increase in weight shall be determined by weighing the completed sample before submersion and weighing the sample with and without the covering after submersion.

Melting Test—A piece of clean white porous paper shall be wrapped around a 6-in. sample of finished wire, and it shall be suspended vertically, placed in a chamber which has been heated to 125 deg. F. and the chamber maintained in this temperature for ½ hour. Wire with the paper sample to be cooled before inspection. The wire shall be rejected if the compound becomes sufficiently fluid to be transferred to the paper, or if it leaves an oily or greasy spot on the paper.

Dripping Test—Pieces of finished wire, 6 in. in length, shall be used for this test, the wire to be bared for a distance of ¾ in. from each end. The samples, with one end secured in a suitable clamp, are then suspended at an angle of 45 deg. in an electrical oven, and maintained at a temperature of 180 deg. F. for one hour. The wire shall be rejected if the compound drips or forms globules on the lower side of the sample.

Tests of Weight of Cotton—The percentage by weight of cotton (or cotton and jute) to total covering shall be determined by weighing a given sample of known length, then removing the covering and weighing it. The compound shall then be removed from the covering by washing with a suitable solvent and then weighing the remaining cotton (or cotton and jute), after drying. The percentages shall be calculated from the weights so obtained.

Solubility—A 4-in. sample of the finished wire shall be immersed in ½ pint of water at 70 deg. F. for one hour. At the end of this time the water shall not be discolored.

Bending Test—A sample of the finished wire (No. 1/0 and larger) shall be wrapped two convolutions around a drum having a diameter five times that of the outside diameter of the wire, and the temperature lowered to 15 deg. F. for ½ hour, then immediately unwound from the drum and straightened out at this temperature.

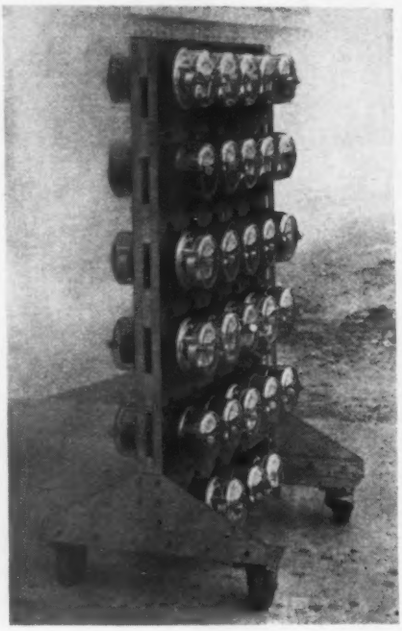
A sample of the finished wire (smaller than No. 1/0 shall be wrapped six convolutions around its own diameter at 68 deg. F. (20 deg. C.)

A complete failure of any sample will be a break of the braid through to the conductor and a partial failure will be the breaking of the stitching in one or two layers of the braid or the breaking off of the compound so as to leave the braid bare.

The cracking of the compound or wax shall not be considered a failure.

A complete failure of more than one sample from any shipment will be considered as cause for rejection of shipment. Partial failure on all the samples will likewise be considered sufficient cause for rejection.

Rack Transports Meters



Constructed in the meter department of the United Illuminating Company, Bridgeport, Conn., the rack shown provides a convenient means of carrying meters from the storeroom to the meter trucks backed up to the garage platform. Outgoing meters for each particular truck are placed on the rack as orders are received and there is no loss of time when the truck reaches the garage ready for the next trip to deliver meters for installation.

Causes and Remedies of Faults in Electrical Instruments

By ARTHUR W. WEEKS, Boston Edison Laboratory

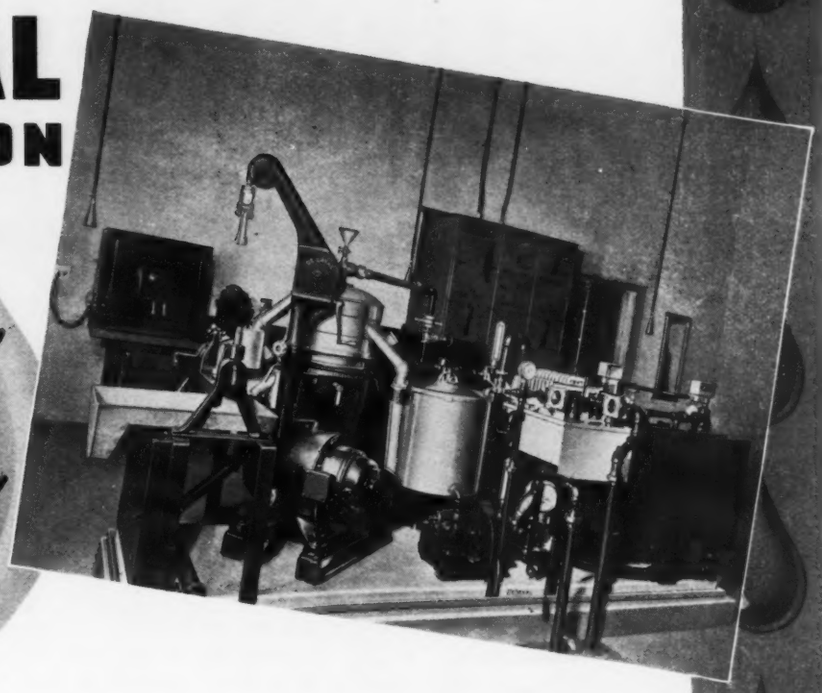
Fault	Probable Causes	Suggested Remedy
Pointer not on zero.	Zero shift due to overload or jar. Pointer bent.	Set zero. Straighten pointer and calibrate.
Pointer sticks.	Shock, dropping or setting down too hard. Unclean pivots and jewels.	Replace mushroomed pivots or cracked jewel. Clean both; replace if necessary.
	Worn pivots or jewels. (Foreign matter in damping chamber or on damping magnets.) Bent damping vane. Foreign matter in armature.	Replace. Clean with gentle stream of air or a magnet cleaner. Straighten. Clean with gentle stream of air or strips of thin paper.
Fails to indicate.	Voltmeters — open armature or series resistor. Short circuited armature. Control spring open.	Repair open or short. Check for grounds to frame.
	Ammeter—armature or circuit from shunt open, control spring open.	Repair open or short.
	Wattmeter — series resistor, armature or lead-in spiral open. Armature short circuited.	Repair open; replace spiral. Remove short or grounds.
	Hot wire instruments — hot wire open or mechanical linkage damaged.	Usually a factory repair.
	Thermal instrument — heater wire or thermo junction may be opened. Though not overloaded, the heater wire may be damaged by opening or closing an inductive circuit with the instrument in circuit.	Usually a factory repair, although a new thermal element may be installed.
	Millivoltmeter circuit open See Voltmeter.	See Voltmeter.
Scale deformed. (Large errors at some portion of the scale.)	Relation of pointer and armature changed due to bent pointer, or pointer shifted on shaft.	Straighten or refasten pointer. Instrument may need rescaling.
	Loose iron vane.	Refasten vane.
	Deformed armature.	Reform or replace armature.
	Iron filings on armature.	Remove filings.
Minor scale errors.	Temperature errors (if these are more evident at the upper part of the scale, they may be due to heating).	Factory repair.
	Poorly soldered joints.	Resolder.
	Damaged pivot or jewel causing the pivot to take a different position in the jewel at different armature positions.	Resharpen or replace pivots. Replace jewel.

EFFICIENT OIL PERFORMANCE AT T·V·A· PLANTS IS ASSURED BY...

DE LAVAL PURIFICATION SYSTEMS

FOR *Insulating Oil*

FOR *Lubricating Oil*



CLEAN insulating oil, governor oil and lubricating oil helps to insure the operating efficiency and dependability of hydro-electric stations such as those built by the Tennessee Valley Authority. Hence, a total of eight De Laval oil purification plants are installed at five T. V. A. stations—Norris Dam, Wheeler Dam, Pickwick Landing, Guntersville and Chickamauga.

In addition, two truck-mounted De Laval Oil Purifiers stationed at Wilson Dam enable efficient, economical maintenance of insulating oil at scattered sub-stations.

These ten high-capacity De Laval Oil Purifiers have been purchased on exacting performance specifications designed by T. V. A. to insure at all times maximum cleanliness of both insulating and lubricating oil.

De Laval Insulating Oil Purifiers are preferred for jobs where utmost dependability is demanded because they:

Operate at high capacity—
Completely purify oil at a single pass—
Continuously discharge water—
Maintain constant high efficiency—
Handle oil at relatively low temperature—
Do not require a blotter press (although one may be supplied for removing colloidal carbon from switch oil).

De Laval engineers will be glad to advise you regarding specialized equipment to exactly meet your insulating oil maintenance requirements. Bulletin No. 107 will be of interest.

• • •

Efficient maintenance of lubricating oil for steam turbines is available through the De Laval-Funk Process. This modern system has solved the lubricating problem connected with the operation of high pressure turbines. It is fully described in Bulletin No. 106, sent promptly on request.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 427 Randolph St., Chicago
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco
THE DE LAVAL COMPANY, Limited
Montreal Peterborough Winnipeg Vancouver

DE LAVAL INSULATING OIL PURIFIERS

INDUSTRIAL ENGINEERING

Position Regulator for Paper Slitters

By F. H. GULLIKSEN
Control Division, Westinghouse Electric & Mfg. Co.

Regulation of position of an unwinding roll of paper is particularly important when the paper has a printed design on it, since the slitting must be done at a definite distance from the printed design. To accomplish this, a line is printed on the paper as part of the design and a phototube is arranged to scan this line.

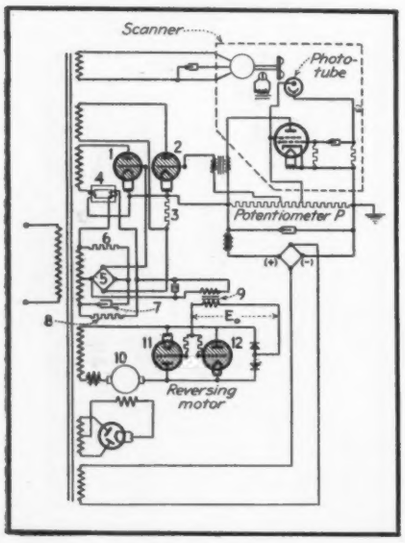


Diagram of position regulator

The phototube scanner consists of an 1,800-r.p.m. synchronous motor with four lenses mounted on its shaft. A lamp is so mounted that the lenses focus four light beams on the paper and the printed indicating line, a phototube intercepting the light reflected from the paper. These light beams rotate synchronously, each beam making one revolution in two cycles. Each time a beam intercepts the line the illumination on the phototube is decreased.

This change in phototube illumination is amplified so that a peaked voltage impulse is obtained once every half-cycle—referring to the frequency of the a.c. source to which the motor is connected. For every position of the line on either side of the center position an impulse is obtained. There is a definite relationship between the angular location of the impulse voltage relative to the a.c. supply voltage and the space location of the line. This relationship is used to indicate the position of the paper.

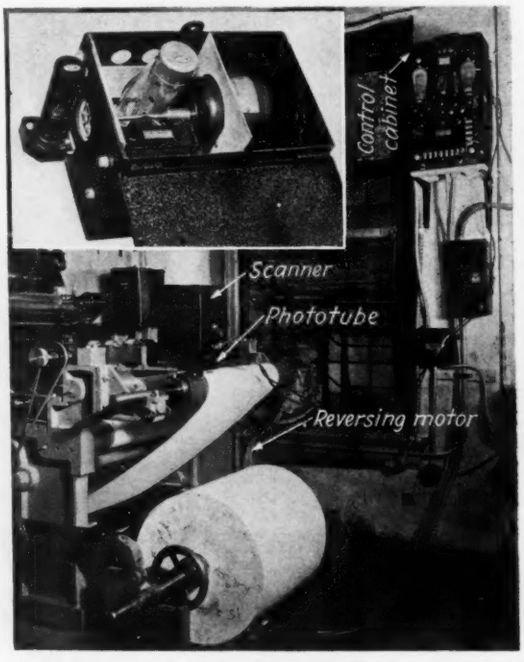
A conventional amplifier with capacitor coupling in the grid circuit and transformer coupling in the anode circuit is used to amplify the phototube impulse. The amplifier output is used to control the selective indicating circuit, this indicating circuit serving to detect the phase-angle location of the voltage impulse obtained from the amplifier.

The details of the circuit of the position regulator follow:

Amplified impulse voltage from the phototube connected in series with a negative d.c. bias voltage, supplies grid control voltage for thyratron tube (2), which is initiated at a point on a.c voltage wave dependent on location of impulse voltage, itself a function of the space location of printed line. When tube (2) becomes ionized, rectified a.c. voltage appears across resistor (3) and persists for rest of the half cycle. This voltage is connected in negative sense in grid circuit of thyratron tube (1), so that this tube cannot become ionized if current is already established through the resistor. Tube (1) has a permanent negative grid bias obtained from rectox rectifier (5), which is supplied with a.c. voltage from the 90-deg. phase-shift circuit made up of resistor (6) and capacitor (7).

Because of the interlock action of resistor (3), tube (1) does not conduct current if the impulse voltage occurs *ahead* of the 90-deg. position. If it occurs *after* the 90-deg. position current flows through tube (1).

Saturable transformer (4) is connected in series with tube (1) and secondary winding of transformer is connected in bridge circuit with resistor (8) so that output voltage of transformer (9) is reversed when the primary winding of transformer (4) is energized. If the line on the paper is moved from one side of the central position to the other, a 180-deg. reversal of voltage E_o results. This condition is used



Electronic position regulator equipment applied to paper slitting machine

Electronic equipment and reversing motor adjust position of unwinding roll to keep paper in same position in relation to slitter knives. This equipment will maintain the position of the paper web within 1/32 in. at web speeds up to 500 ft. per minute when edge of webs at roll of paper varies as much as ½ in. Phototube scanner shown in inset, top left.

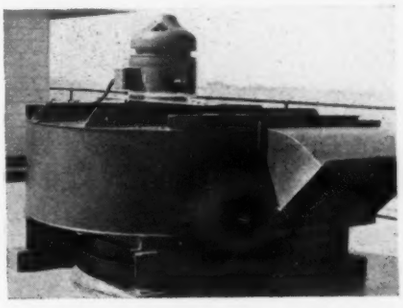
to obtain reversal of the armature voltage for the roll-adjusting motor. The armature of this motor (10) is supplied with reversible rectified a.c. voltage by the two thyratron tubes (11) and (12).

•

Mount Vertical Motor Directly on Air Vent

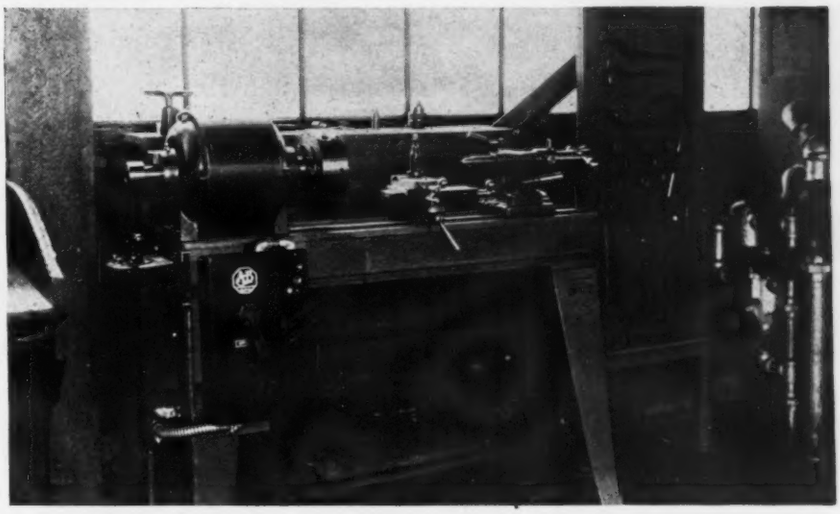
Ventilation of the 5,500-hp. electrically equipped dredge *S. G. Hindes*, being used on the fill of the $13,500,000 U. S. Naval Air Base on San Francisco Bay, is accomplished by means of a 10,000-cu.ft.-per-minute fan, driven by a conventional, vertical irrigation pump motor, which is externally mounted.

This type of installation saves space, permits direct installation of the blower in the air duct and improves the appearance of the job. The blower is mounted so that its intake fits directly over the top of the 32-in.-diameter air duct which extends from the interior of the dredge to the deck. The 7½-hp. motor is direct-connected to the fan, being carried on a special mounting which surmounts what normally would be the side of the blower. The installation was devised by engineers of the Pacific Bridge Company, which has the contract for dredging.



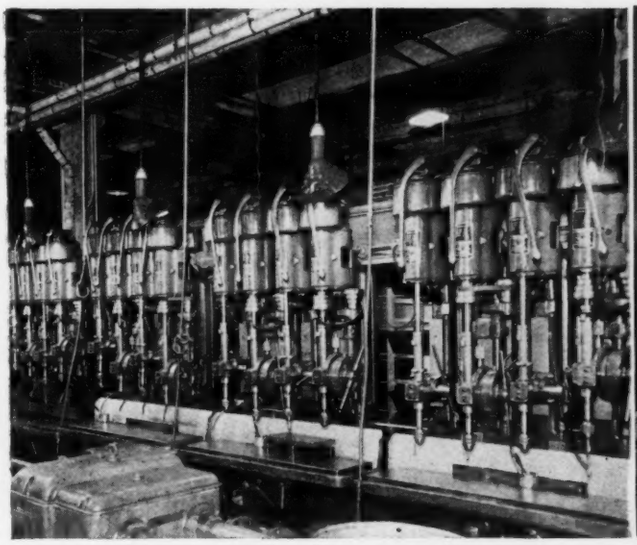
Conventional irrigation pump motor, externally mounted over fan atop air duct

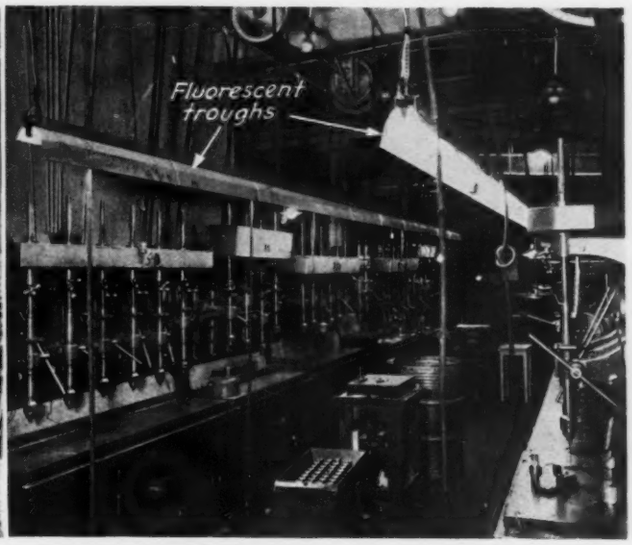
Individual Drive For Lathe Gains Space



A Blount speed lathe with 10-in. swing at the plant of the Blanchard Machine Company, Cambridge, Mass., was formerly located in a relatively dark area and driven from an overhead line shaft which restricted its position. By removing the old cone drive and substituting a four-speed direct-connected Crocker-Wheeler 0.5-hp., 550-volt a.c. motor, the company was able to relocate the lathe in front of a window with greatly improved lighting conditions, also eliminating the former line shaft and shipper stick, with worth-while saving in space. An Allen-Bradley starter and Cutler-Hammer four-speed drum control were mounted on steel plates attached to the frame of the lathe, and with rigid and flexible conduit wiring provided an all-metal-clad job. Speeds are 600, 900, 1,200 and 1,800 r.p.m., lathe being used mainly in burring and polishing machine parts.

Even Illumination With Fluorescent





Illumination was spotty, ranging from 25 to 40 ft.-candles, at points along this row of drill presses at the Signode Steel Strapping Company, Chicago, before fluorescent lighting was installed. The old 200-watt elliptical angle reflectors mounted on 4-ft. centers over the drills were replaced by 30 36-in., 30-watt fluorescent lamps in the trough shown. This trough, mounted 4 ft. above and 1 ft. in front of the drill beds, gave an even illumination of 45 ft.-candles throughout the length of the row of presses. Its compactness was admirably suited to the restrictions of the narrow aisle.

Photo courtesy Commonwealth Edison Company

NEW ENGINEERING IDEAS

Automatically Controls Shunt Capacitors

By R. V. SANFORD
Electrical Superintendent
Tucson Gas, Electric Light & Power Company

A scheme is used by this company whereby shunt capacitors automatically regulate the voltage at a point 11.2 miles out from the generating station on a 13.2-kv. feeder.

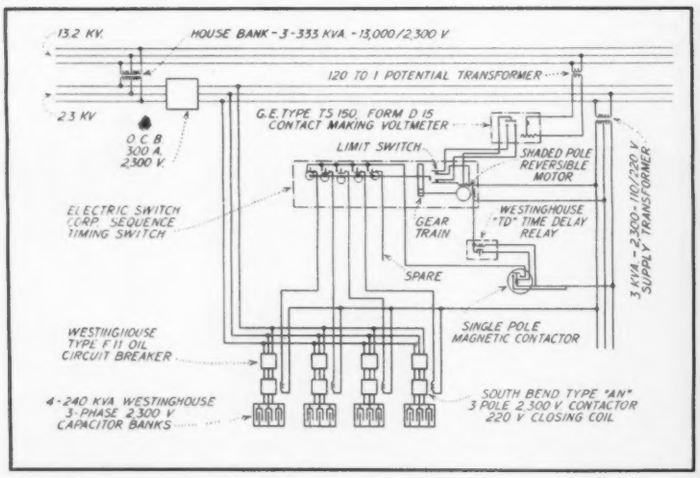
There is a pumping load of about 1,200 kva. at 80 per cent power factor in an area of which the load center is approximately 11 miles from the Tucson generating station. During the pumping season, which extends from early April to late September, the load reaches its 1,200-kw. peak. During this time pumping is almost continuous, although there are periods of 24 to 48 hours when considerable reduction in load may occur.

During summer this line is occasionally tripped momentarily at the Tucson end by electrical storms. When voltage is restored load is light for several minutes while time-delay relays at each pumping plant are gradually restoring load. During this period condenser units may cause dangerous voltage rise on the low-voltage bus at the Cortaro steam plant substation. A high-voltage alarm relay was installed and breakers were carefully adjusted to trip at excessive capacitor current.

During this period the company completed addition of a 6,250-kva. turbine to the Tucson plant and the need of the Cortaro steam plant for reserve capacity became considerably less. It was desirable to reduce the operating crew to one man at this point. Some form of automatic capacitor control was indicated. Accordingly the setup shown was designed and built locally.

This device has been in service continuously for fifteen months, giving excellent voltage regulation at this point. Since its installation we have lost no individual capacitor units from high voltage, as occasionally happened with manual control.

Adjustment of the contact-making


13.2 KV.
HOUSE BANK - 3 - 333 KVA. - 13,000/2,300 V.
120 TO 1 POTENTIAL TRANSFORMER
2.3 KV.
O.C.B. 300 A. 2300 V.
G.E. TYPE TS 150, FORM D 15 CONTACT MAKING VOLTMETER
LIMIT SWITCH
SHADED POLE REVERSIBLE MOTOR
3 KVA - 2,300 - 110/220 V. SUPPLY TRANSFORMER
ELECTRIC SWITCH CORP. SEQUENCE TIMING SWITCH
GEAR TRAIN
WESTINGHOUSE "TD" TIME DELAY RELAY
SPARE
SINGLE POLE MAGNETIC CONTACTOR
WESTINGHOUSE TYPE F 11 OIL CIRCUIT BREAKER
SOUTH BEND TYPE "AN" 3 POLE 2,300 V. CONTACTOR 220 V. CLOSING COIL
4 - 240 KVA. WESTINGHOUSE 3-PHASE 2,300 V. CAPACITOR BANKS

Simple scheme prevents dangerous voltage rise, saves equipment and obviates need for supervision

Wiring diagram for automatic capacitor control (left), end view of one rack unit with its associated line switch (center) and control panel (right), with contact-making voltmeter at top, sequence switch, time-delay relay and auxiliary contactor as arranged.

The contact-making voltmeter controls the movement of a shaded-pole reversible motor, which in turn drives a shaft on which are mounted adjustable cams attached to the main shaft of the sequence timing switch. The cams are so adjusted that mercoid switches are closed in sequence during one revolution of the shaft and opened in the reverse sequence during one counter-revolution of the shaft. The mercoid switches operate the holding coils for the capacitor oil switches. These are installed between the main capacitor oil switches and the capacitor units. A time-delay relay is connected to hold the 220-volt closing coil supply off the line for 90 seconds following an interruption on the 13-kv. system. The delay enables the control to prevent momentary high voltage following an interruption which may have occurred during full-load.

7 Reasons for Specifying KEARNEY Con-nec-tites

1 Wire sizes are clearly stamped on the heads of Con-Nec-Tites.

2 Hexagonal head fits securely into wrench and permits positive tightening.

3 Uniform slot widths are accurately checked to within limits of 3/1000ths of and inch.

4 Maximum pressure between conductors is obtained by clean threads and use of full-round washer.

5 Patented Full-Round Washer affords a smooth, low-friction bearing surface for the nut.

6 Uniform threads provide easy nut engagement; minimize nut friction and transmit most of exerted torque into direct pressure between conductors.

7 A thread "lead pilot" permits easy starting of nut onto bolt.

THERE ARE MORE THAN 75 STANDARD CON-NEC-TITES

For Better Maintenance and Construction—

Use KEARNEY PRODUCTS

MADE BY THE **JAMES R. KEARNEY CORPORATION**
4224 CLAYTON AVE., ST. LOUIS, MO., *Canadian Office:* TORONTO, ONTARIO, CANADA

voltmeter is wide enough to prevent pumping. A variation of 2 volts is necessary to cause sufficient movement of the voltmeter beam to travel from closure of the raising contact to closure of the lowering contact, or reverse. Under no condition of line loading will one condenser bank cause more than 1½ volts variation on the low-tension side of the potential transformer.

On an installation of this kind care must be taken to avoid an objectionable voltage rise on the secondary side of the power transformer. The leading condenser current being partly offset by the transformer reactance causes a greater voltage rise on the low side of the power bank than appears on the high-tension side. If the power bank has sufficient capacity, proper taps and good regulation no trouble need be expected from this cause.

•

Lightning Generator Micro-Second Switch

High-voltage, high-current lightning generators produce a stroke discharge which simulates the three components of natural lightning: (A) High voltage followed by (B) high current, finishing with (C) low-current discharge for a longer period, this latter portion being popularly termed "hot" or burning lightning. A micro-second switch provides a means for releasing the high-current discharge some two- to ten-millionths of a second after the voltage discharge is initiated.

As applied to factory testing, the switch consists of a fiber tube with a small hole running down its center, placed in series with the high-voltage generator. High temperature caused by breakdown of air in this small hole vaporizes a small quantity of fiber which is expelled violently out of the hole. Tube is mounted so that the gas is discharged across the gap, holding back the charge of the high-current generator, lowering the electrical strength of this gap and permitting the current generator to loose its charge into the lightning circuit.

Lightning generators of this type have been applied recently to production testing of distribution transformers of the completely self-protected type at Westinghouse Electric & Manufacturing Company.

•

Cork Prevents Sweating of Condenser Shell

By C. E. MILLER
Engineer, Potomac Electric Power Company, Washington, D. C.

Prevention of sweating on the larger pieces of auxiliary equipment handling cold water is usually a problem. It is particularly difficult to use the standard type of insulation on such places as condenser water boxes or circulating water pumps and piping, due to their size and shape. An economical and satisfactory solution to this problem, as used at Buzzard Point station, is to paint such places with a special cork sizing.

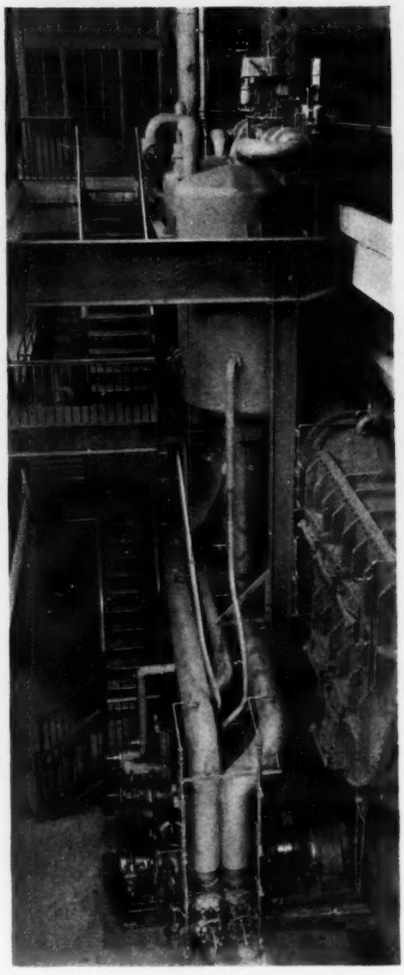
The details of this application are as follows: The surface to be treated should first be given a prime coat of red lead. This should be followed with a thick coat of special paint of a composition described below:

Quantity of 100 Gallons	
Whiting	735 Lb.
Interior varnish	65½ Gal.
Raw linseed oil	3⅞ Gal.
Drier	3⅛ Gal.

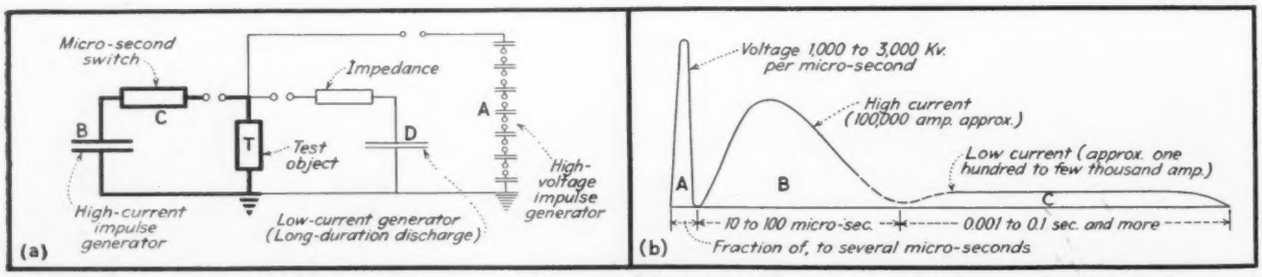
The varnish should be of good grade and quick-drying. A good quality japan drier should be used as the last-mentioned ingredient.

Granulated cork is then applied to the wet surface, either pneumatically or by hand. An ordinary vacuum cleaner has been satisfactory to blow the cork onto the wet surface. The cork itself should pass a No. 8 screen and rest on a No. 12. This procedure gives a very thin coat of insulation which is satisfactory for almost all purposes. If a slightly heavier coat is desired it can be obtained by repainting with the special paint and a second application of cork. Finally, after the special paint is dry, the surface should be given a finish coat of lead and oil paint.

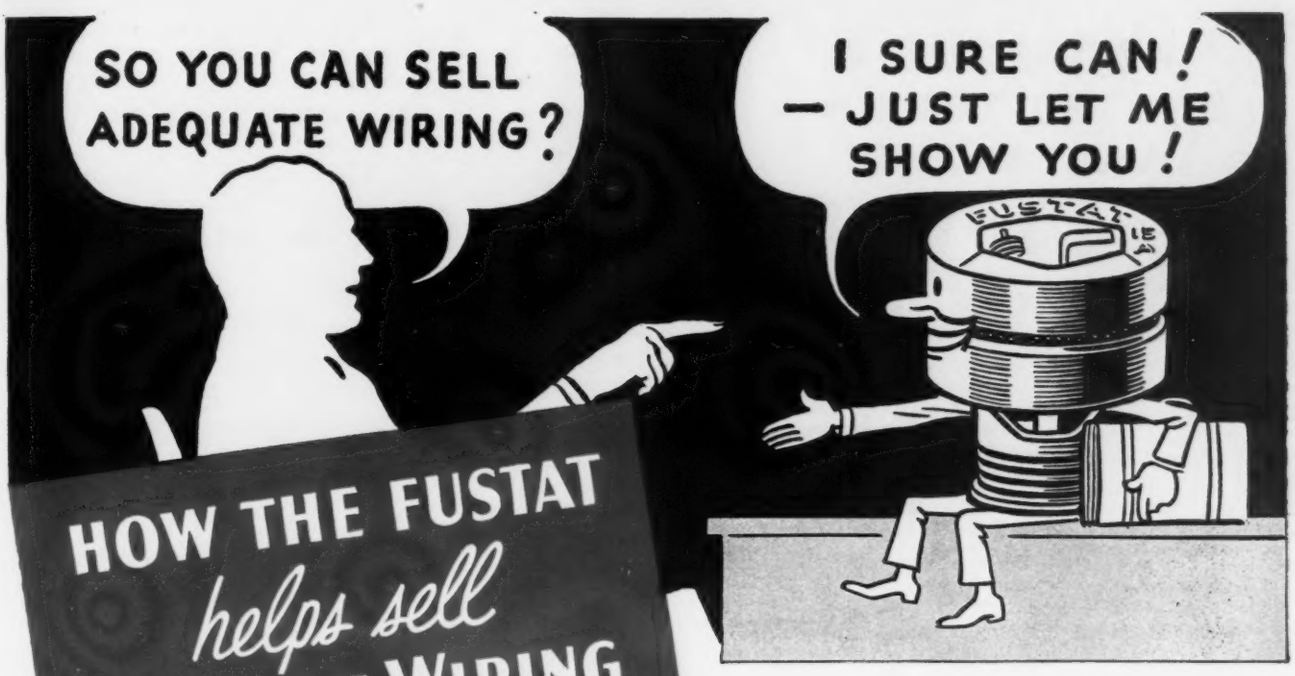
The finished appearance of this insulation is also very satisfactory, as can be seen in the illustration.



Special coating carrying pulverized cork prevents sweating of bulky shells and large circulating pipes



Micro-second switch in high-voltage, high-current lightning generator (left) times release of high-current discharge (B)
In the routine testing of distribution transformers the micro-second switch is placed in series with the high-voltage generator and the low-current generator providing the long-duration discharge that is known as "hot" lightning is omitted.



HOW THE FUSTAT *helps sell* ADEQUATE WIRING

The Fustat says to users —

"No overloading, please, you'll have to install new circuits"

Users cannot permanently overload a circuit when it is protected by a Fustat of correct size. The Fustat cannot be replaced with a larger size and bridging it in any way is virtually impossible. If additional circuits are needed the user cannot side-step the issue at the sacrifice of safety.

The Fustat says to users —

"Now your toaster, percolator, etc., will always heat up quickly"

The user cannot load the circuit beyond the proper capacity of the copper. This prevents a voltage drop that is so frequently the cause of complaints about toasters, percolators and other appliances not operating efficiently.

The Fustat says to users —

"Now it's perfectly safe to add all the outlets you need"

Since the Fustat guards the circuit wiring against permanent overloading it becomes a perfectly safe practice to add as many convenient outlets to the circuit as are desired.

The Fustat says to users —

"In case of trouble I'll help keep all your circuits from being thrown out of service"

The branch circuit Fustat will almost invariably open on a short-circuit or overload, AHEAD of the main fuse or Fustat — because it cannot be replaced with an over-size fuse nor readily tampered.

When it does blow to protect, the shutdown is confined to just one circuit — and only the normal load of one circuit is off the line — instead of a user possibly having all of his lights and appliances out of service because a main fuse blew.

The Fustat says to users —

"I'll prevent many annoying interruptions of electrical service"

The long time-lag of the Fustat keeps it from opening when motors start on washing machines, refrigerators or other appliances, even though the circuit is loaded to approved capacity. Needless blows and irritating service interruptions are eliminated without sacrifice of safety.

The Fustat says to users —

"I'll help show you that the 'electrical way' is the best way"

The Fustat helps sell the electrical way of doing things — for it generally permits users to add new appliances without being annoyed by needless blows . . . it assures proper operation of appliances because low-voltage cannot be caused by overloading . . it reduces chances of users being frightened by shorted cords burning up, for the quick action of the Fustat on dangerous cord shorts — prevents spraying of metal, starting of fires, burning of users . . . it helps teach user that the protective device is a desirable safeguard instead of a nuisance . . . *thus it assists the whole industry to build towards bigger business and better times.*

WHAT IS THE FUSTAT?

It is a fuse to which a thermal cutout is added.

It protects like a fuse against short-circuits — even high resistance shorts such as occur in flexible cords.

It protects against permanent overloads, even when as light as 25%.

Retails at 7½c

Yet it will not blow on motor starting currents of washing machines or other appliances.

It has a base that guards against anyone robbing the circuit of protection.

It fits Edison base fuseholders through the use of an inexpensive adapter.

It's just good business to sell, install and use Fustats

The FUSTAT

For Full information write to any of these Firms

BUSSMANN MFG. CO., University at Jefferson, St. Louis, Mo.
JEFFERSON ELECTRIC COMPANY, Bellwood, Ill.
KIRKMAN ENGINEERING CORP., 121 Sixth Ave., New York City
NATIONAL ELECTRIC PRODUCTS CORP., Fulton Bldg., Pittsburgh, Pa.
UNION INSULATING CO., 27 Park Place, New York City

Retails at 7½c in 15 to 30 amp sizes

NEW EQUIPMENT

Line Truck

Of the cab-forward type, this new earth-boring, line-construction truck is similar to a cab-over-engine unit. However, the engine is mounted at the rear and the

Model "GG"; boring machine for digging holes up to 48 in. in diameter and 10 ft. deep; 25-ft. integral-type derrick handles poles up to 45 ft. long; 102-hp. engine. **The Four Wheel Drive Auto Co.**, Clintonville, Wis.

boring machine on the front end of the truck. Controls for operation of the boring machine are located in cab, making it possible for the driver to operate the boring machine, driven from a take-off shaft operative through the five speeds of the truck. Cab provides vision for the driver in spotting the auger over the stake. Through a trap-door arrangement in the top of the cab, he can watch the pole being moved or raised with the derrick provided by a sheave atop the tower of the boring machine. Tower may be lowered, for traveling purposes, to a horizontal position.

•

Load Distributor

"Load Distributor" for motor-generator sets. **I-T-E Circuit Breaker Co.**, Philadelphia, Pa.

Developed chiefly for mining service, this device is offered for use in improving service from one or more motor-generator sets operating in parallel in the same trolley and feeder system but at widely separated locations. Connected in series with the positive lead of the generator, the unit operates to reduce the voltage of the motor-generator set when peak swings above full-load current are encountered. Claimed advantages of the device include balancing of substation loads, limiting of overload peaks, reducing of breaker outages, prolonging of armature life and lessening of armature burning.

•

Tamper-Resisting Fuse

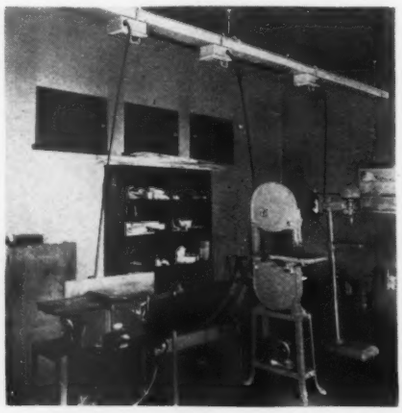
"Tamres" fuses; in capacities of 15, 20, 25 or 30 amp.; used with regular adapter or new adapter with locking spring. **General Electric** appliance and merchandise dept., Bridgeport, Conn.

Three new tamper-resisting plug fuses and a new adapter with a locking spring have been announced by this company's wiring device section. (Previous announcement in ELECTRICAL WORLD, October 7, 1938.) Fuses have standard medium Edison bases and will fit any standard fuseholder or cutout. They may be used as an ordinary plug fuse without the adapter, or serve as a tamper-resisting plug fuse if the adapter is screwed into the fuseholder ahead of the fuse. In this case, the adapter remains secured in the cutout, if the fuse is removed, protecting against tampering.

•

Distribution System

A lower-capacity "Flex-A-Power" system has been announced by this company for service as a feeder distribution system in small factories, work shops and garages



"125 Flex-A-Power"; 125-amp., 2- and 3-poles, for 575 volts or less; 10-ft. units; "Flex-A-Plugs", 30-amp., 2- or 3-pole, 250 volts, convertible 30-60 amp., 2- or 3-pole, 250 and 575 volts. **The Trumbull Electric Mfg. Co.**, Plainville, Conn.

where there are few machines, short runs and comparatively light connected load requirements. Connections to the machines may be made by plugging in with "Flex-A-Plugs" at any point on 12-in. centers.

Power Pike Pole

With this unit, one man can do the work of from two to six men in straightening leaning poles, according to the manufacturer. It is built of two pieces of galvan-

Power pike pole; minimum height 8 ft. 2 in., maximum height, 11 ft. 7 in.; weight, 32 lb. **Coffing Hoist Co.**, Danville, Ill.

ized pipe, one section telescoping in the other. Power is obtained through the company's "load binder" or hoist. The unit has a steel base and its top is constructed so that it will not slip off the pole.

•

Vacuum Cleaner

"Tornado" portable electric blower. **Breuer Electric Mfg. Co.**, Chicago, Ill.

An attachment called the "Skraptrap" has been added to this portable electric blower; in vacuum cleaning around benches, machines or shelves, it collects small objects—bolts, nuts, screws, nails, etc.—preventing them from reaching and injuring the suction fan blades. It may thus be used to collect and salvage small parts.

•

Hydraulic Jack

"Inspector's" jack; low over-all height of 11 in., rise of 6¼ in.; top of toe lift is 2 in. above base of jack; weight, 20½ lb. **The Buda Co.**, Harvey, Ill.

Toe-lift device on this hydraulic jack, developed primarily for track inspectors on railroads, is said to make it serviceable for construction and maintenance work of public utility companies.

"AS THE PROOF OF THE PUDDING IS IN THE EATING"

—SO THE BEST CLEVIS

IS ONLY AS GOOD AS THE SERVICE IT GIVES. HUBBARD CLEVISES ARE DESIGNED TO PROVIDE HIGH MECHANICAL STRENGTH AND GREAT RESISTANCE TO FLASHOVER. FURNISHED IN ALL SIZES AND STYLES.

HUBBARD AND COMPANY

PITTSBURGH . . . OAKLAND . . . CALIFORNIA . . . CHICAGO

"HANG THE LOAD ON HUBBARD HARDWARE"

Utility Trailer

Cable reels and other heavy electrical equipment may be transported in this new utility trailer. Tailboard acts as a ramp; one man can load and unload the reel,

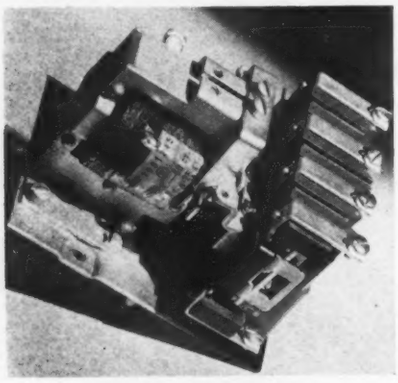
"Roeder - Utility - Trailer"; 6 - ton capacity; other capacities available; load space of trailer is 26-in. from ground. **Fred Roeder Mfg. Co.**, Brooklyn, N. Y.

using the hand winch, which is equipped with a brake for unloading. Loaded, the trailer unit may be towed by a 1½-ton chassis and unhitched at the destination, minimizing tie-up of motor equipment.

•

Multi-Pole Contactors

Multi-pole contactors for use on machine-tool control and other built-in control applications have been announced. In addition to individual relays, there are assemblies of two relays mechanically inter-



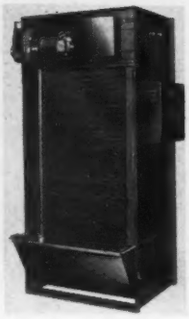
Type "Dn-00" contactor in a four-pole unit; line rated at 10 amp., 600 volts maximum, in 2- to 8-pole forms. Dept. 7-N-20, **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa.

locked. Latched-in contactors or relays have also been developed. Identification labels show voltage and frequency rather than the more conventional identifying number, guarding against mistakes and confusion.

•

Air Filter

Electrical precipitation is combined with automatic air filtration in this new electric air filter, to provide the advantages of both these methods of cleaning air. Front curtain of the filter removes heavier dust particles, and any bugs or scraps of materials that might short-circuit the ionizing unit in the center of the filter or the collector plates in the rear curtain. Electrically charged dust particles leaving the ionizing unit are attracted to the charged collector plates and are held in the oil film on the plates until removed in the oil bath. Filter curtain has reverse direction of rotation so that dust and dirt on front curtain is removed by oil bath in reservoir, leaving clean and freshly oiled rear curtain.

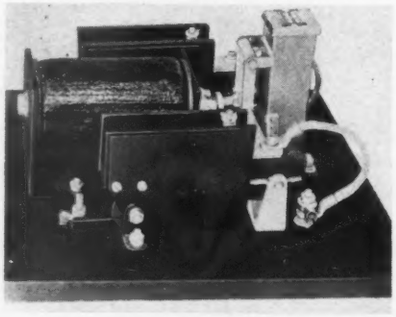


"Electro-Matic" air filter; in standard sections from 5 ft. to 13 ft.; filter drive and power pack connect to 110-volt a.c. lighting circuit. **American Air Filter Co.**, Louisville, Ky.

•

Control Relay

Absence of a.c. hum, simplification of control wiring with the trip-free style and operation of trip-free relay independent of proper functioning of the breaker are



Type "C" control relay; trip-free and non-trip-free, single- and double-pole models; a.c. up to 440 volts, d.c. to 250 volts. **Roller-Smith Co.**, Bethlehem, Pa.

stated characteristics of a new control relay. It is designed to be interposed between contacts of control switch or push button and the circuit breaker or other equipment to be controlled when the current-carrying or current-interrupting capacity of the control switch or push button is less than the current needed by the apparatus being controlled.

•

Lighting Outfit

Mercury lamps are used in this portable outfit, adaptable for fluorescence, photography or floodlighting. Using the red-purple bulb, the outfit may be used for activating the fluorescence of minerals,

Type "H-4" outfit; uses either of 100-watt "H-4" mercury lamps—clear or red-purple bulb. **General Electric Vapor Lamp Co.**, Hoboken, N. J.

fluorescent paints, dyes and chemicals and for the detection of impurities or adulterants in drugs, chemicals and foodstuffs and for textile testing, and examination of works of art, precious stones, and the like. For photographic purposes, the unit is said to be more effective than high-wattage incandescent lamps. For spot and floodlighting purposes, a clear bulb is used.

•

A.C. Arc Welder

Ten heat stages are provided on the control panel of these transformer type welders. Ground and electrode holders remain undisturbed when making heat changes, a separate control cable being used to shift from one heat tap to the next. Welder is open at top and bottom for natural circulation of air around the transformer for ventilation.

A.c. arc welders; 150-, 200- and 250-amp. ratings, 220 volts, 60 cycles. **K. O. Lee & Son Co.**, Aberdeen, So. Dak.

•

Electric Pail

Designed for farm and industrial uses, this 14-qt. galvanized pail is equipped with a heating element and safety control, which

"Electro-Pail"; heating element is 1,250 watts, for 120 volts, a.c. and d.c. **Electromaster, Inc.**, Detroit, Mich.

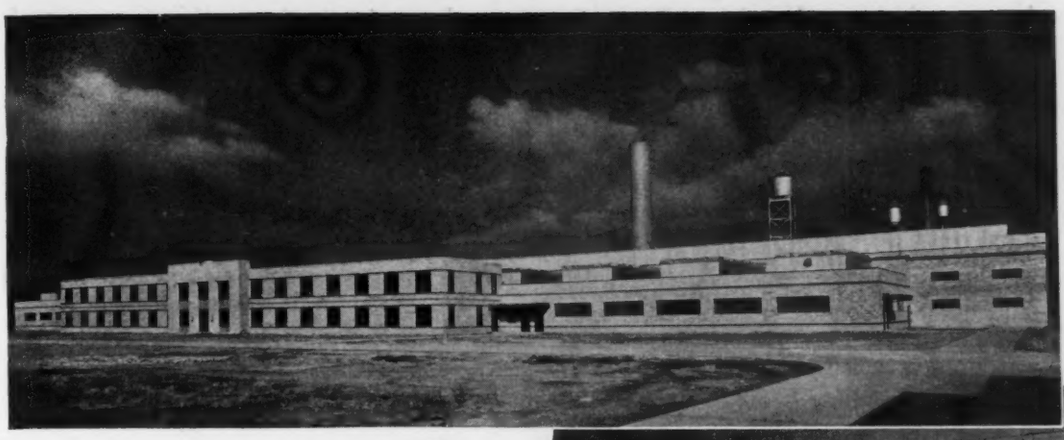
protects the element from being burned out by automatically ejecting the connecting plug from the shroud if the water gets too low.

•

Tap Switches

Tap switches; 10-, 20-, 40- and 75-amp., 240 volts a.c. **Ohmite Mfg. Co.**, Chicago, Ill.

High-amperage tap switches are offered for heater or oven control, arc or spot welders, voltage regulators, motor control, tapped transformers, meter circuits, machine tools, and other switching requirements. They are multi-point, load-break, non-shorting, single-pole rotary selectors designed for a.c. use. Contacts and mechanism are completely enclosed. Silver-to-silver contacts are used. Cam-and-roller mechanism provides slow-break, quick-make action.



Industrial Rayon Corporation's new 14-acre, windowless, air-conditioned plant at Painesville, Ohio, for continuous spinning of new type rayon yarns. Its modern electrical equipment is protected by the 60-cell Exide Control Battery shown below.

Exide
CONTROL
BATTERIES

THIS $11,500,000 RAYON PLANT IS PROTECTED BY EXIDE CONTROL BATTERY

BUILT and equipped to produce 12,000,000 pounds of rayon yarn annually by means of a revolutionary, continuous spinning process, the new $11,500,000 plant of the Industrial Rayon Corporation at Painesville, Ohio, is a model of modern construction.

Fourteen acres of air-conditioned floor space are encompassed within its windowless, brick and glass walls which, incidentally, represent the largest structural glass installation on record. The 15,000,000 gallons of water required daily as well as the amount of power generated by the three 5,000 k.w. turbo-generators, are adequate to meet the residential needs of a city of approximately 450,000 population.

Every item of equipment used in this ultra-modern textile plant was chosen with exceptional care. In view of this fact, it is significant that a 60-cell Exide Battery should have been selected for control service.

You will find that Exide Batteries are widely used for control and other stationary services by many of the country's best equipped private industrial and public utility plants. If you would better understand the reasons for their wide acceptance, write for Bulletin 204, or for information concerning your specific battery problem.

THE ELECTRIC STORAGE BATTERY COMPANY

The World's Largest Manufacturers of Storage Batteries for Every Purpose

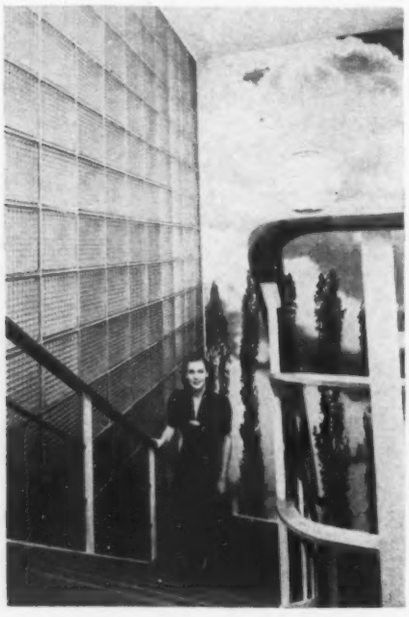
PHILADELPHIA

Exide Batteries of Canada, Limited, Toronto

LOAD BUILDING

Fluorescent Lamps for Permanent Exhibit

One of the largest installations of fluorescent lamps in New York illuminates the fabric, furnishings and model homes of the permanent exhibition of decoration, architecture and craft—House of Homes Exhibit—



Two-story high glass block wall on the stairwell of the modern house in the Pedac House of Homes Exhibit in Rockefeller Center is lighted entirely by fluorescent daylight tubular lamps. Light sources in the globular ceiling fixture also are fluorescent tubes

which opened recently in the Rockefeller Center, International Building.

A third of the fluorescent lamps produce white light and two-thirds the color corrective daylight illumination popular with artists and textile exhibitors. Approximately 760 ft. of lamps have been supplied to the exhibit alcoves by Westinghouse Electric & Manufacturing Company.

The most spectacular of the many uses to which these lamps are put is the creation of an illusion of daylight behind a glass brick wall in a modern house, the wall being approximately 23 ft. high. In the all-glass foyer 52 of these lamps are being incorporated in a luminous pylon of opaque glass 11 ft. high. Fluorescent lamps are being used also in diagonal strips over a display of fine glassware. Additional lighting at the exhibit consists of 62 standard reflector and projector lamps and 31 Magnalux units.

•

Rural Load With High Load Factor, Revenue

By V. A. BLOXHAM, LYLE W. SMITH
Southern California Edison Co., Ltd., Visalia

An entire new field for electrical use, served at unity power factor and 75 to 95 per cent annual load factor, has been opened to the Southern California Edison Company through the development of an exceptionally successful steam accumulator by its San Joaquin Valley Division. Few energy-consuming devices possess such ideal characteristics, and the Edison development climaxes a fifteen-year period during which scores of utilities experimented with accumulators, only a pitifully small percentage of which have stood the gaff.

While the electric accumulator is finding its way into numerous commercial and industrial applications, it specifically was designed to provide steam for sterilizing milk-handling equipment on dairy farms. Other units for the milk-producing industry have failed because of their high connected load, short operation time and need of expert attention.

Edison's studies quickly showed that to overcome these limitations a new line of development would have to be pursued and that the new equipment would have to embody these "musts":

1. Must operate as continuously as possible.
2. Must require few or no added service facilities.
3. Must require minimum field service.
4. Must be susceptible to operation by common dairy labor.
5. Must produce steam immediately on demand.
6. Must be priced within the means of the customer.
7. Must be competitive in operating cost.
8. Must sell as a packaged article.

Thus two years of engineering study and development pursued the low-wattage, storage principle, with results which have, by exhaustive field tests, proved even more satisfactory than expected.

No new principle is involved, but, rather, accepted principles are combined to produce a satisfactory result. The device consists essentially of a high-pressure, A.S.M.E. code boiler which receives its heat from an immersed, low-wattage, pressure-controlled, electric resistance element. The boiler is a simple steel shell without tubes or other internal obstructions.

High Load Factor Results from Six Typical Dairies

Installation	Type Dairy	No. of Cows	Watts Connected	Average Daily Kw.-Hr.	Annual Load Factor, %
A	Can*	135	2,000	40	83
B	Bottle	40	1,500	32.2	89
C	Can	40	1,000	13.8	58
D	Bottle	60	3,700	81	90
E†	Can	90	2,000	33.5	70
F	Can	60	1,500	30	83
Average		71	1,950	38.4	82.1

* 10-gal. cans. † 525 days' operation.

Selling lamps and lighting in

PORTLAND, OREGON

HERE'S the way General Electric advertising is constantly at work in Portland, promoting light-conditioning for Better Light-Better Sight. Into Portland homes every week goes a steady stream of G-E lamp and lighting advertisements amounting to 59 impressions per person in the last ten years.

IN 1939 . . . . . 1,470,000 magazines with G-E lamp advertisements and 528,000 radio messages.

SINCE 1929 . . . . 15,435,000 magazines with G-E lamp advertisements.

FALL 1938 . . . . . 727,690 copies of Portland newspapers with G-E lamp advertisements.

LAST 3 YEARS . . . 2,412,000 newspapers with G-E lamp advertisements.

SINCE 1929 . . . . 19,959,000 advertisements in magazines, newspapers, and radio . . . which is approximately 59 advertisements per capita.

AND FOR ANY CITY . . . Your own for instance, you can easily estimate the approximate number of lamp and lighting advertisements General Electric is delivering to your customers by applying the following national averages:

Going into the average wired home in 1939

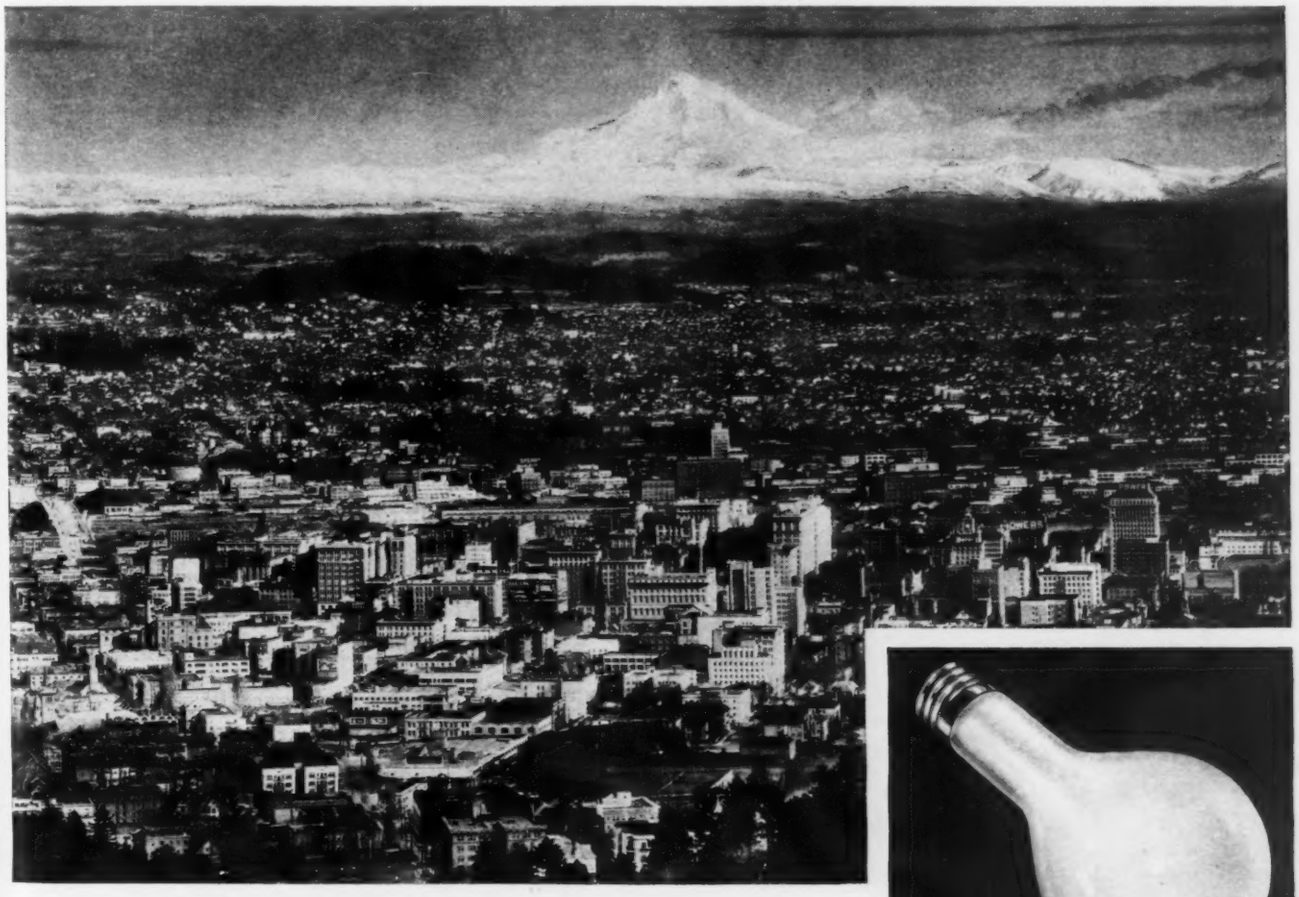
14 magazines with G-E lamp ads
5 newspapers with G-E lamp ads
5 radio messages
24 total advertising messages

• • •

In the last 10 years, the average wired home received

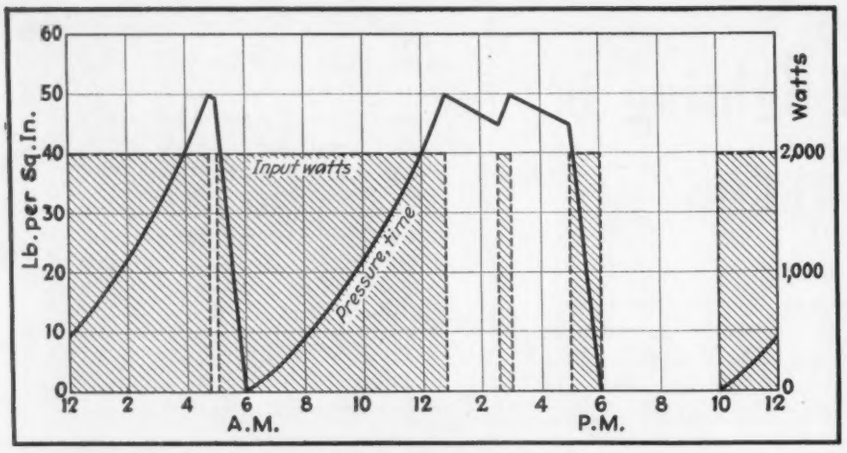
158 magazines with G-E lamp ads
30 newspapers with G-E lamp ads
20 radio messages
208 total advertising messages

View of Portland, population 337,183. Mt. Hood towers fifty miles in the distance.



G-E MAZDA LAMPS

GENERAL ELECTRIC



Load and pressure curves in daily operation of steam accumulator
Shaded area shows hours of use. Time clock removes device from line from 6 to 10 p.m.

29,000 kw.-hr. per year are used by this 4-kw. steam accumulator installed in dairy. Scours 3,000 lb. glass and 1,000 lb. utensils

At present 4.5- and 10-cu.ft. capacities are available. These accommodate a range of dairy sizes which include dairies of several hundred cows. Connected load ranges from 750 to 2,000 watts for the smaller unit, 1,500 to 3,000 watts for the bigger one. Selection of wattage is based upon maximum steam requirements and the working habits of the individual dairyman. For both sizes legal gage pressure is 100 lb. per sq.in.

Operating procedure differs radically from usual boiler practice. Sterilizing in the average farm dairy normally occurs at 12-hour intervals and for 20 to 40 minutes requires a large amount of steam. Continuous capacity of the heating element is of no moment in serving this demand, and only 5 to 10 per cent of the water is evaporated during the sterilizing period. The remainder functions only as a storage medium.

No provision is made for withdrawing heated water. Wash water is heated by steam injection directly into the cold water from the live-steam line.

Following the heavier of the two withdrawals, the boiler is refilled. Only a small expansion space is left as steam storage is of small consequence in the operating cycle.

This filling procedure—opening the cold water supply valve, reclosing it when the boiler is filled—is the only manual operation. Heat is then stored and pressure rises until the pressure control disconnects the unit. When steam is needed the outlet valve is opened, internal pressure drops and the superheated water releases energy through vaporization.

For maximum economy it is vital both to select proper boiler and element sizes and to adjust maximum steam pressure.

Where peak load on rural lines must be considered time-control may be added. Load and recovery characteristics for a unit taken off the line from 6 to 10 p.m. are shown in an accompanying illustration. Connected load is 2,000 watts.

Wide flexibility is possible, for almost any load characteristic can be obtained with suitable load limiters, double-throw switches, etc. In any case, proper application and adjustment to the individual customer's demands is of paramount importance.

Typical operating results are shown in the accompanying table, which presents data on six dairies. It has been found that steam use increases when an accumulator is installed, because of constant availability.

On most of the dairies where these units have been used to date operating cost has not exceeded the former cost of fuel for far less satisfactory apparatus. With revenue of $40 per hp. per year on energy at 1 cent per kw-hr., where practically no new facilities are required to serve, it is felt that a substantial share of a vast potential load may be made available to electric operation.

•

Utility Awards Prize Trip to Convention

Leonard R. Adler, commercial salesman at Arkansas City, has won a free trip to the National Restaurant Convention and the Commercial Electric Cooking Council Convention at Chicago next October.

The trip was offered by Kansas Gas & Electric Company as a prize in its Profit Broadcast Commercial Electric Cooking Campaign to the salesman who scored the highest percentage above his quota. Mr. Adler produced 352 per cent of the quota assigned him, but even then won by the narrow margin of 13 per cent over his closest competitor.

The entire campaign exceeded its goal by approximately 180 per cent, at a cost of 37 cents per dollar of estimated annual revenue. Low-priced natural gas provides competition in the territory. The contest began on March 27 and closed May 24. A total of 120 counter cookery appliances were added to the lines, the list comprising:

Toasters	29	Roasters	7
Coffee makers	28	Hot plates	4
Waffle bakers	17	Roll warmers	3
Grills	10	Doughnut kettles	2
Fry kettles	10	Miscellaneous	2
Ranges	8		

"This campaign has been unusually successful from the standpoint of demonstrations, which we have found to be the keynote to the successful closing of sales on commercial cooking equipment," according to Roy K. Bear, commercial manager. "Demonstrations also provide the salesmen with a large number of prospects who will be sold in the near future."

As a Booster

As a booster, the importance of your T & B Distributor cannot be overlooked. He serves the same community that you serve. He is interested in local civic problems, and is a factor in the growth and development of the Municipality.

Your T & B Distributor is one of the strongest links in your Public Relations program. This fact grows out of his closeness to the people who are his customers, and who are *your very customers*, too. As a supplier of electrical equipment . . . heaters . . . fans . . . radios . . . refrigerators . . . washing machines . . . vacuum sweepers . . . and all kinds of household appliances . . . he is an important business ally. He has earned his T & B franchise because of the service he can render to his community, and because of the service he renders the Electrical Industry by active participation in campaigns such as Adequate Wiring, etc.

T & B products are sold only through T & B Distributor facilities. Make use of "The T & B Plan" . . . you will eliminate time-taking, expensive shopping around and avoid the hazards that accompany inferior electrical materials. But most important—you will always know where you can get what you want . . . when you need it.

#2

A series of advertisements designed under the T&B Plan to set forth the economic reasons for the fixed T&B Distributor policy.

The T&B DISTRIBUTOR SERVES and SAVES

The T & B Distributor Saves You Money

HE REDUCES THE "HIDDEN COSTS" BECAUSE:

He eliminates depreciation and obsolescence
He eliminates stock investments
He eliminates insurance and taxes
He saves on freight and cartage

HE SAVES YOU ADDITIONAL DOLLARS BECAUSE:

There are fewer orders to write
Fewer shipments to handle
Fewer invoices to check
His Catalog and price information is up to date.

T&B

THE THOMAS & BETTS CO., Inc.

MAIN OFFICE and FACTORY ELIZABETH, N. J., U. S. A.

SALES OFFICES

Los Angeles, California • San Francisco, California • Denver, Colorado • Atlanta, Georgia • Chicago, Illinois • New Orleans, Louisiana • Boston, Massachusetts • Detroit, Michigan • Kansas City, Missouri • St. Louis, Missouri • Elizabeth, New Jersey • New York City, New York • Syracuse, New York • Cleveland, Ohio • Cincinnati, Ohio • Philadelphia, Pennsylvania • Seattle, Washington • Dallas, Texas • Montreal, Quebec • Toronto, Ontario • Winnipeg, Manitoba • Vancouver, B. C.

EXPORT DEPARTMENT — BROOKLYN, NEW YORK

ELECTRICAL FITTINGS SPECIALISTS SINCE 1899

NEWS ABOUT PEOPLE

Leeds & Northrup Elects Leeds Chairman of Board

Morris E. Leeds, founder and president of the Leeds & Northrup Co., Philadelphia, has assumed the position of chairman of the board of directors and Charles S. Redding, vice-president in charge of research and engineering, has become president, in an expansion of the company's executive set-up effective July 10. Chairman of the Board is a position newly created to facilitate Mr. Leeds' participation in policy matters with which he will continue active.

This promotes to the presidency of the company one who has spent with it almost his entire business life. Mr. Redding has held executive positions in every division of its activities. He became second vice-president in 1918, was treasurer from 1922 to 1924, and became vice-president in charge of research and engineering in 1928. He is a member of the American Institute of

M. E. Leeds

Electrical Engineers, Franklin Institute, American Physical Society and the American Association for the Advancement of Science.

It was in 1899 that Mr. Leeds started his own business, providing an American source of "null" or balance-type

Harris & Ewing

C. S. Redding

electrical measuring instruments. Equipped with inventive talent, a knowledge of the instrument industry and a business philosophy at once practical and liberal, his enterprise was firmly entrenched and widely known to the scientific world in a very few years.

He then proceeded to the pioneering development of the automatically-operated balance-type instrument which would not only measure, but would also record, signal and control. Some years later, in 1920, he was awarded the Edward Longstreth Medal of merit of the Franklin Institute for this invention. Paralleling this development of products, manufacturing methods and markets was the development of policies and methods to apply Leeds' philosophy of business and social justice within his organization. The successful working out of these plans was evidenced by the presentation to him in 1931 of the Forbes Award for the best employer-employee plan actually in operation. The Institute of Management in 1936 awarded its Gantt Medal to Mr. Leeds, citing him for "distinguished achievement in industrial management as a service to the community." Mr. Leeds has always been active in education affairs. Brooklyn Polytechnic Institute gave him the honorary degree of Doctor of Engineering in 1936 and in 1939 he was elected president of the Board of Education of Philadelphia.

•

John D. Noyes Retires from Detroit Edison Co.

John D. Noyes, engineer on the president's staff of the Detroit Edison Co., has retired. A graduate of the University of Wisconsin, Mr. Noyes' first connection was with the Westinghouse Electric & Manufacturing Co. and in 1913 he joined the staff of Detroit Edison. Growing with his assignments, he was appointed senior sales engineer and in 1926 was assigned to the president's staff. His retirement was entirely voluntary and was in accordance with a plan he conceived many years ago.

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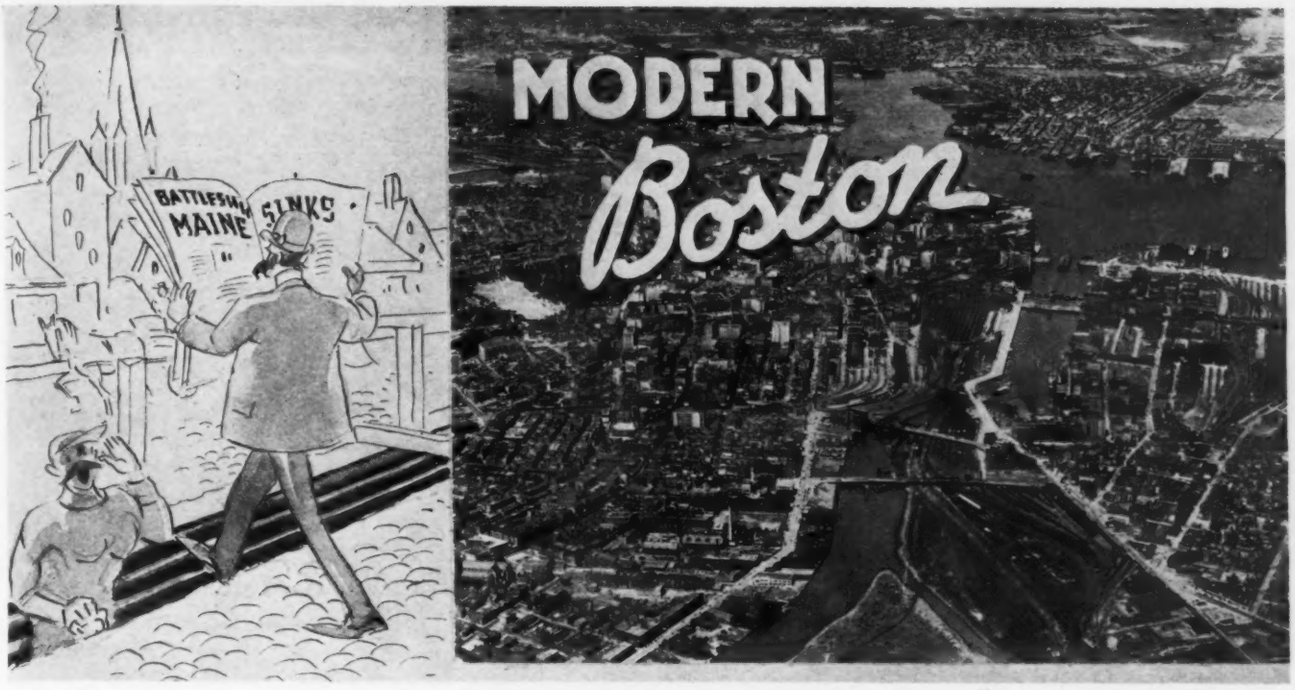
▶J. E. Bogan, manager of dealer sales promotion, Central Illinois Light Co., Peoria, has resigned to take the position of assistant to the sales promotion manager of the Association of Gas Appliance and Equipment Manufacturers, New York. Don J. Reuder, supervisor of the home lighting department, has been designated to take over management of dealer sales promotion.

▶W. H. MacDonald, for the past thirteen years electrical engineer in the Green Bay electrical department of the Wisconsin Public Service Corp., has become a member of the personnel and public relations department, recently organized. This department, operating under the direction of C. B. Boulet, Milwaukee, will have its headquarters in Green Bay.

▶Arthur L. Cook has been appointed director of the Pratt Institute school of science and technology, Brooklyn, N. Y. Mr. Cook has been serving as acting director of the school since the death of Dr. S. S. Edmands last year. He has

ORANGEBURG HAS *long* BEEN PART OF



© Fairchild Aerial Surveys, Inc.

In many sections Boston "underground" (electrically), is literally "Under-salt-water". Cable protection for continuity of service to this key center of New England manufacturing is of outstanding importance.

"BENDS" SAVINGS

Compare the cost of a 90° 36 inch radius bend (for instance) in metal with an ORANGEBURG NOCRETE bend.

Wherever you have been using metal, underground, for electrical raceway, ORANGEBURG NOCRETE — the dual-economy conduit — warrants consideration.

Savings in material costs.

Savings in installation costs.

There are many ORANGEBURG "points that count".

Orangeburg, trademark, is a guarantee of the best of Fibre Conduits, a time-tested enduring "service" of cable protection *wherever electrical raceway facilities are to be installed underground.*

● Perhaps it is only natural that Boston, site of the first events leading to American Independence, should be among the first cities to install ORANGEBURG Fibre Conduit.

Since 1893, when The Fibre Conduit Co. pioneered a material of unique merit for permanent cable protection, the trademark ORANGEBURG has maintained leadership by constant research for product and service improvement. Even installations made 40 and more years ago are still providing cable protection and clear usable raceway.

ORANGEBURG NOCRETE has been proven a worthy companion to ORANGEBURG STANDARD.

For installation underground WITH CONCRETE ENCASEMENT: ORANGEBURG STANDARD Fibre Conduit is recommended for duct banks (4 ducts and over), main distribution, high tension and "down-town" locations.

For installation WITHOUT CONCRETE ENCASEMENT: the ORANGEBURG dual-economy NOCRETE conduit is recommended for service entrances, extensions, parkways and street lighting, suburban distribution, laterals, signal systems, etc. NOCRETE is readily cut by a wood saw. It can be tooled to exact fit with inexpensive, portable tooling machine, hand operated. It also gives permanent cable protection.

Sales Agent—Distributors

GENERAL ELECTRIC SUPPLY CORP.

GRAYBAR ELECTRIC COMPANY INC.

MADE AT ORANGEBURG, NEW YORK
BY THE FIBRE CONDUIT COMPANY
292 MADISON AVE., NEW YORK CITY

ORANGEBURG *Standard* for installation *with* concrete encasement
NOCRETE for installation *without* concrete encasement

been a member of the institute faculty for 30 years and was head of the department of electrical engineering for 25 years before assuming the duties of acting director. Mr. Cook is the author of "Elements of Electrical Engineering," a textbook, and "Electric Wiring," a book for architects and engineers.

▶ HERBERT H. ROGGE, formerly manager of the syndicate division of the Westinghouse Electric International Co. with offices in New York City, is now manager of the Westinghouse Electric & Manufacturing Co.'s agency sales department with headquarters in Pittsburgh.

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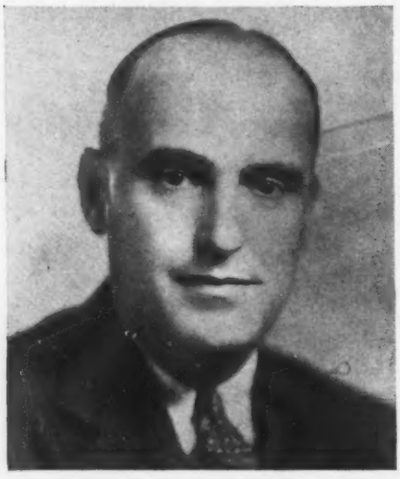
Cutler-Hammer Appoints Horter Sales Manager

B. M. Horter has been appointed general sales manager for Cutler-Hammer, Inc., Milwaukee, with direct supervision of sales for the company in its twenty-four selling territories throughout the country.

Prior to his new appointment, Mr. Horter was in charge of the resale sales division at the Milwaukee headquarters and has had a wide background of experience with the company, holding a number of patents on motor control apparatus. He first became associated with Cutler-Hammer as a sales engineer in the Philadelphia territory and in 1921 he was given the



responsibility of opening a new sales territory in the Wilkes-Barre, Pa., region. Later he was appointed manager of the New England sales territory with headquarters in Boston. In 1934 he was called to the headquarters of the company at Milwaukee to become manager of resale sales.

Mr. Horter is an active member of the National Electrical Manufacturers Association, representing Cutler-Hammer, in the industrial control section.

H. L. Andrews Made Head of G.E. Appliance Dept.

H. L. Andrews of Bronxville, N. Y., vice-president of the General Electric Co. since 1934 in charge of the company's transportation activities, will take charge of the appliance and merchandise department with headquarters in Bridgeport, Conn., Charles E.

Wilson, executive vice-president, has announced.

A native of Missouri and a graduate of the University of Missouri, Mr. Andrews entered the employ of General Electric in 1910 and for the past 29 years has had wide range of experience in the engineering, manufacturing and sales departments. For the past three years he has been vice-chairman of the company's sales committee.

As head of the appliance and merchandise department, Mr. Andrews will be responsible for the company's activities in the major and traffic appliances as well as construction materials, including such items as refrigerators, ranges, water heaters, home laundry and household appliances.

•

▶ FRED BROOKS has been named superintendent of the Paris (Tenn.) Board of Public Utilities to succeed John Sweeney, resigned. Mr. Brooks was accountant for the board.

▶ E. R. WAGNER has resigned as superintendent of the light and water department at Waterloo, Wis., to become general superintendent of the REA construction program in Wisconsin. He takes over his new duties at Adams, Wis., August 1.

▶ JOHN L. PROCTOR, president of the Noma Electric Co. of Canada and chairman of the board of its British affiliate, was elected a director of Claude Neon Lights, Inc.

OBITUARY

Lamar Aldridge

Lamar Aldridge, vice-president and treasurer of the Alabama Power Co., was instantly killed July 10 in a fall from the third floor of an Asheville, N. C., hospital. He was 46 years of age.

Mr. Aldridge had been associated with the Alabama utility for 25 years. A native of Alabama and a graduate of the University of Alabama in law, he took a position in the legal department of the Alabama Power Co. immediately upon completion of his law course. He held this position until 1917, when he entered military service, and following his discharge from the army he returned to that office. In 1920 he was made secretary of the company and in 1926 treasurer. It was in 1935 that he assumed the duties of vice-president.

•

Francis H. Miller

Francis H. Miller, president and cofounder of the Hoosier Engineering Co., Columbus, Ohio, died at his home in that city July 4, after an illness of two years. He was 47 years of age.

Mr. Miller was well known in the public utility industry for his accomplishments in the field of transmission line construction. A native of Indianapolis and a graduate of Purdue University, he became associated with the General Electric Co., but severed this connection soon after completing the test course to enter the employ of the Indianapolis Power & Light Co., for which he had worked at intervals since boyhood. He served this company in various engineering capacities until 1919, when he left to found the Hoosier Engineering Co. with Wallace O. Lee and T. N. Wynne. He served this company as vice-president and then as president until the time of his death.

•

▶ PAUL W. GREENLEAF, construction superintendent, Nevada-California Electric Corp., Riverside, died June 4, following an operation, at the age of 55. He began his association with the Riverside utility in 1909 as a construction foreman and through the years participated in most of the major construction work of the company, being made superintendent of construction in 1920. One of his outstanding accomplishments was to lead a rescue party in 1911 to save several people injured and marooned as the result of a snowslide in the Mill Creek plant in Mono Basin, during which several employees lost their lives, the story of which is one of the classic rescue recitals in the company archives.

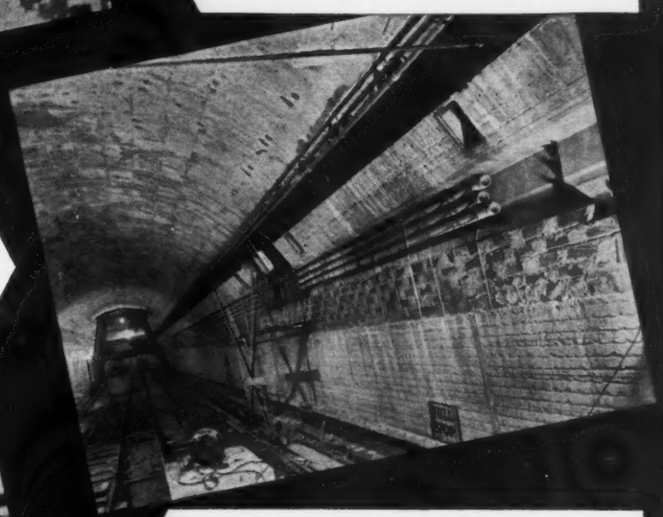
MONEY-SAVING CONDUIT...

CUTS COPPER LOSSES

Mineral and entirely inorganic, Transite Korduct has an exceptionally high rate of heat dissipation. Cables run cooler . . . I^2R losses are lower. As a result, the carrying capacity of a cable is appreciably increased . . . and the system will show a greater return per dollar of investment.

CANNOT BURN

Korduct is an asbestos-cement product . . . 100% fireproof. Its high resistance to flame and arc prevents damage to adjacent cables and equipment when burnouts occur. It never contributes to formation of fumes or combustible gases. And because Korduct does not rot or decay, maintenance costs stay low.



MORE VALUE PER DOLLAR

Korduct's light, long lengths assure easy, economical handling. It lines up fast and accurately . . . requires fewer joints and spacers. It furnishes extra fireproofing between cables—the equivalent of additional concrete. Its smooth bore stays smooth—assures easy pulls on new installations or replacements.

JOHNS-MANVILLE JM PRODUCTS

YOU can use Transite Korduct to reduce distribution costs wherever cableways must be "concreted-in." And you save on open and exposed locations by using Transite Conduit, thicker walled and so durable that no protective casing is needed. You'll want to keep the facts about both on file. Write for brochure D. S. 410. Johns-Manville, 22 East 40th Street, New York, N. Y.

Johns-Manville TRANSITE KORDUCT

FOR INSTALLATION IN CONCRETE

MANUFACTURING - MARKETS

Orders Gain Shown by General Electric

Continuing in the second quarter the improvement in orders received during the first three months this year over the 1938 periods, General Electric Co. reports an increase of 32 per cent in orders received during the first six months this year over the same 1938 period.

Gerard Swope, president, stated that orders received during the first six months totaled $169,071,646, as compared with $128,223,823 for the like six months last year, an increase of 32 per cent.

During the first quarter this year General Electric reported orders received of $86,882,953, as compared with $65,376,400 for the first three months of 1938, an increase of 33 per cent.

•

G. E. Lamp Units Merged

General Electric Vapor Lamp Co., Hoboken, N. J., has been merged with the incandescent lamp department of General Electric Co., Charles E. Wilson, executive vice-president of General Electric, has announced. Because of this change, effective July 1, by which General Electric's activities in incandescent and electric discharge lamps are brought together, the incandescent lamp department will hereafter be known as the lamp department of the General Electric Co.

•

Household Refrigerator Shipments Hit New Peak

An all-time high in household refrigerator shipments for the May-June period has been established this year by the Westinghouse Electric & Manufacturing Co. plant in Mansfield, Ohio. R. C. Cosgrove, manager of the refrigeration department, said that refrigerator shipments since May 1 had a retail value estimated at $10,100,000.

"There is some indication that the sales season for refrigerators is lengthening," Mr. Cosgrove said. "This means a stabilizing of production as well as sales. The refrigerator industry is in far healthier shape this year than last."

•

Emerson Electric Wins Case Before Labor Board

The National Labor Relations Board has dismissed the complaint lodged against the Emerson Electric Manufacturing Co., St. Louis, by Local No. 1102, United Electrical, Radio and Machine Workers of America, affiliated with the CIO.

The board dismissed the allegation that the company had discriminatorily discharged William H. Corter, and that it had interfered with the rights of its employees by refusing to arbitrate the issue of his discharge. In addition, the board dismissed the remainder of the complaint which stated that a company booklet had interfered with the employees' rights under the Act.

•

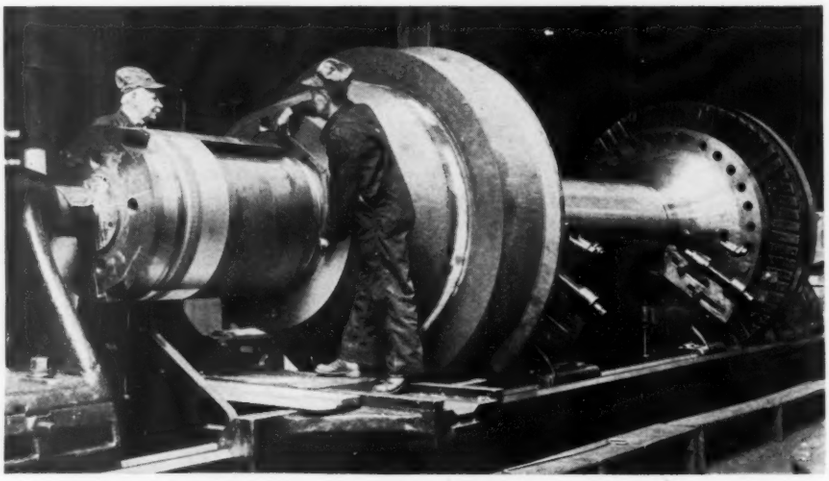
BullDog Elects Officers

BullDog Electric Products Co. has announced the election of the following officers: William H. Frank, president; M. C. Emery, executive vice-president; J. J. Mitchell, vice-president in charge of sales; A. J. Lennerts, vice-president in charge of manufacturing; William H. Frank, secretary, and M. C. Emery treasurer.

•

Laundry Unit Shipments Increase During May

For the seventh consecutive month factory shipments of household washers in May showed an increase over the corresponding month a year ago,



PRODUCTION IN FULL SWING—Shop view at the Allis-Chalmers plant in Milwaukee showing turning operation on huge shaft belonging to one of the three 30,000-kva., 13,800-volt, 75-r.p.m. vertical waterwheel generators being constructed there for the Chickamauga Dam of the TVA. The shaft proper is 34 in. in diameter and over 21 ft. long. The thrust block which has been shrunk onto the shaft is shown being machined

totaling 105,266, compared to 84,016 in May, 1938, according to figures reported to J. R. Bohnen, executive secretary of the American Washer and Ironer Manufacturers' Association. This represents an increase of 25.2 per cent. May ironer shipments increased 26.3 per cent, being 8,433, compared to 6,675 a year ago. For the first five months of this year washer shipments were 32.4 ahead of the same period in 1938, totaling 613,984, compared to 463,544. Ironers showed a slight advance, aggregating 45,311 for the five months, compared to 44,303.

•

Manufacturers Provided Joint Representation

Electric Associates has just been organized to provide representation throughout the Rocky Mountain and Pacific Coast territory for three leading manufacturers of electrical equipment, it was announced jointly by the Reliance Electric & Engineering Co., the Clark Controller Co., both of Cleveland, Ohio, and the Electric Machinery Manufacturing Co. of Minneapolis, Minn. The Pacific Northwest main office of the group will be in Portland, Ore.

L. F. Newton, formerly a West Coast electrical manufacturer and identified with the industry for nearly twenty years, will head the Pacific Northwest section of Electric Associates.

•

Line Material Awarded Carrier Current Order

What is believed to be the largest single contract of its kind for carrier current control equipment has recently been awarded by the Memphis Light, Gas and Water Commission of Memphis, Tenn., to the Line Material Co. at an approximate cost of $104,000.

The equipment will provide central station remote control of street lighting, water heater and other loads by high frequency carrier current over the 60-cycle system without pilot wires or other auxiliary methods. Equipment is to be manufactured by the East Stroudsburg, Pa., division of the Line Material Co.

New York Metal Prices

	July 11, 1939 Cents per Pound	July 5, 1939 Cents per Pound
Copper electrolytic ...	10.25*	10.00*
Lead Am. S. & R. price	4.85	4.85
Antimony	12.00	12.00
Nickel Ingot	35.00	35.00
Zinc Spots	4.89	4.89
Tin Straits	48.50	48.75
Aluminum, 99 per cent.	20.00	20.00

* Delivered Connecticut Valley.

Highway BODIES

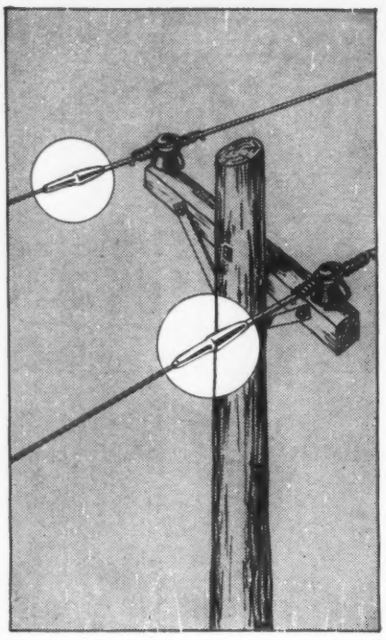
—have ample roominess —are lightweight yet rugged
—offer comfort to the crew—are designed for utility service
—are convenient in arrangement —are fully dependable

Save money over longest service periods with Highway truck Bodies

—they answer every need because they were designed around utility service needs. They are modern in every respect — every unit of space is advantageously utilized. Standard equipment includes Highway Winches, Derricks, Tools, Racks, etc. Get the facts—write today.

HIGHWAY TRAILER CO.
EDGERTON WISCONSIN

Modernize
YOUR DISTRIBUTION PRACTICE—



Urban construction where line drops portion of load and smaller wire size will carry current flowing through the rest of circuit.

RELIABLE STRAIGHTLINE REDUCERS . . . .

Save money and clean up appearance while eliminating a double dead-end. Sag of larger wire is only increased two or three inches as spans of city distribution are short.

Reliable ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE - CHICAGO, ILLINOIS

Field Reports on Business

Reports made to the ELECTRICAL WORLD *from various sections of the country indicate that the industrial upward trend shown during the past month is continuing, with marked activity in various lines. Electrical equipment orders show moderate increases. Lighting is very active. Appliances continue in great demand, with electric fans booming.*

NEW ENGLAND

Orders placed in this district reported last week include about $50,000 worth of equipment consisting of two 4,000-kv. regulating units for the Auburn substation of the Central Maine Power Co. and 10,000 ft. of 23-kv. cable and, in addition, approximately 10 miles of primary distribution cable totaling about $40,000 for the underground service extensions of the Taunton, Mass., municipal light plant. Small motors continue to sell in small lots; industrial electrical equipment orders are being received in steady volume from machine manufacturers in southeastern Massachusetts and Rhode Island. Inquiries for July are holding up well and predictions are being made that an encouraging trend will carry through the summer. A 250-hp. motor was bought a short time ago for a rubber processing plant; a group of twelve 5-hp. motors has been sold to a Vermont machine manufacturer and fractional motors are receiving steady attention by appliance manufacturers.

Commercial lighting is advancing and fluorescent lighting is very active. In the neighborhood of 150-200, 300-watt lighting units are to be bought by a prominent machine manufacturer, and since the beginning of 1939 Taunton, Mass., has installed 150 G.E. "79R" lamps on its streets. The Gilchrist Co., Quincy, Mass., has installed modernized lighting and illuminated signs utilizing a power load of about 80 kw. Appliance sales are progressing, with refrigerators leading in interest. Vermont central stations sold 464 refrigerators over a three-week period in June; Brockton Edison Co. placed 754 electric ranges in its territory during 1938.

In the Boston area thirteen new industries, employing more than 300 people, have started up during the past two months. Metal and machine industries are faring well at the beginning of the second half year.

PACIFIC COAST

As predicted, electrical business lost some momentum during the latter part of June, which, therefore, finished below May despite its early gains. This reversal is partially attributed to some uncertainty over building bolstered by public funds, but may be overcome by excellent agricultural and mineral factors. July, however, may record another somewhat disappointing month because of standardized period of vacations for soliciting salesmen and widespread cessation of work through the WPA strike. Schools will be particularly affected, as they are approaching their summer peak, with many prospective electrical installations ranging from $25,000 to $50,000 in value. Recent copper wire price increases have strengthened all related lines. No considerable wire orders are pending, though Los Angeles recently placed 5,000 ft. of 750,000- and 1,000,000-circ.mil, 35-kv. cable.

Recent War Department recommended expenditures included an $8,000,000 air depot for Utah, a $4,000,000 air base for Fairbanks, Alaska; $600,000 barracks for Hamilton Field near San Francisco, and $10,000,000 additional for Hickam and Wheeler Fields in Hawaiian Islands. Recent low bids include $2,882,000 for barracks and administration structures at Alameda Naval air station; $295,900 for Schofield barracks near Honolulu; and $513,000 for coast guard seaplane base at San Francisco.

NEW YORK

With contra-seasonal gains continuing and six months' reports—just beginning to appear—showing gains over previous periods, the outlook for the electrical industry—as well as for industry in general—looks very pleasant, despite the indefinite situation abroad. Recently two of the largest electrical manufacturers reported increases of more than 30 per cent for the first half of 1939 over 1938; this week an electric storage battery company in this area told of a 25 per cent gain in six months' business for this year over last, attributed, in part, to the heavy industries.

An industrial lighting equipment manufacturer reports its June business was the best in eighteen months; a wiring specialty maker finds its business 25 per cent better than a year ago; a transformer company expected June to prove one of the best months it has ever had. The copper industry, while it still has a long way to go to return to 1930, is currently favored and apparently encouraged by rising demands and firm prices. Possibly reflecting the situation abroad, securities remain dull.

CHICAGO

The business picture presented further encouragement last week as activity continued to advance in many lines. Industrial production maintained the upward trend shown during the past six weeks and retail trade increased to 18 per cent above a year ago. Wholesalers report volume approximately 22 per cent over last year.

Orders for electrical equipment continue to show moderate increases. Electric fan sales boomed as a result of the hot weather and interest in air conditioning increased sharply. A large apartment building is installing 202 electric ranges. A sugar refining plant has recently changed over from 220 to 440 volts and installed two large electric furnaces and 90 motors totalling 950 hp.

Contract for the electrical work on the $1,000,000 municipal power plant at Holland, Mich., has been awarded to the Dearborn Electrical Construction Co. of this city. The Norris Grain Company will rebuild two grain elevators recently destroyed by fire. Cost will be over $400,000, including elevators, conveyors and other electrical equipment.

Montgomery Ward & Co. has started construction of a $1,500,000 four-story addition. Construction of fourteen other industrial buildings have been announced for a total expenditure of $553,140. The city electrical department has requested bids on 30,000 ft. of 5,000-volt lead-sheathed cable, 50,000 ft. of two-conductor telephone wire and 300 porcelain-enameled reflectors.

Recent Rate Changes

PENNSYLVANIA POWER CO. has filed a new tariff with the state Public Utility Commission, effective July 1, which makes annual net reductions in rates of $168,000 and annual net increases of $2,300. The changes affect 28,107 customers. Approximately 27,476 residential customers are given reductions totaling $105,800 a year. This has been done by withdrawing the immediate rate, affecting 19,439 customers, and substituting the objective rate and by the establishment of a 1¾ cent step for all use in excess of 100 kw.-hr. a month and up to 500 kw.-hr. per month, affecting 8,037 customers. The 1,300 commercial customers on Rate No. 10 will save approximately $6,500 a year by having their active load assessment reduced by elimination of outside lighting and battery charges. The remainder of the reduction, amounting to $55,700 is distributed among industrial primary power, high tension power and seasonal ice-making customers. Application of $1 minimum charge, instead of the present 50 cent minimum, to certain residential and commercial customers in New Castle and South New Castle will effect a total increase of $1,600 in the annual bills of 520 residential customers, and a total increase of $700 in the annual bills of 185 commercial customers.

SOUTH CAROLINA POWER CO. will reduce electric power bills of customers by a total of $200,000 annually under rate schedules to go into effect August 1, according to an announcement of the South Carolina Public Service Commission. The reduction affects residential, commercial and industrial consumers, with the commercial customer getting the larger proportion of the cut. The residential consumer, using 50 kw.-hr. and paying $2.75 for it under the current rate, will, under the new rate pay $2.57. The customer who now pays $4.20 for 100 kw.-hr. will pay $3.92. The reduction will bring an annual saving of $1,200 to state rural electrification projects and rural co-operative REA projects, on a basis of the business done in 1938.

SAVANNAH ELECTRIC & POWER CO. has reduced its residential rates, beginning with meter readings on July 1, approximately 10 per cent. The new residential rate will be as follows: $1 for the first 15 kw.-hr.; 4.5 cents per kilowatt-hour for the next 60 kw.-hr.; 2.0 cents per kilowatt-hour for the next 125 kw.-hr. and 1.5 per kilowatt-hour in excess. C. C. Curtis, president, has announced that this is the third rate reduction made by the company in the past nine months. Estimated total savings to customers as a result of the three cuts amounts to approximately $100,000 a year.

KINGSPORT UTILITIES CO., Kingsport, Tenn., has reduced residential electric rates 22 per cent for all customers using 30 or less kilowatt-hours a month, C. A. Thornburg, general manager, recently announced. The new rates became effective June 1. In addition a substantial reduction was also given to commercial customers. On the basis of per cent consumptions the reduction was estimated to produce savings to electric customers in the amount of $48,000 a year. The new rates are as follows: domestic service, 3.9 cents per kilowatt-hour for first 50 kw.-hr. per month; 3.0 cents per kilowatt-hour for next 50 kw.-hr. per month; 2.5 cents per kilowatt-hour for next 200 kw.-hr. per month; 1.5 cents per kilowatt-hour for excess; minimum monthly bill, $1.00. Commercial service, 3.9 cents per kilowatt-hour for first 60 kw.-hr. per kw. plus; 3.0 cents per kilowatt-hour for next 1,000 kw.-hr.; 2.0 cents per kilowatt-hour for next 2,000

[*Continued on page 99*]

...and service is restored

perhaps an ***hour sooner!***

RADIO TELEPHONE enables you to meet and beat emergencies faster. It improves continuity of service—prevents loss of revenue—increases customer goodwill.

Western Electric 2-way equipment enables you to get repair crews on the job faster. They can call you for needed supplies. They can tell you the minute that service can be restored.

New equipment for you

Whether you supply light and power to a limited territory or have far-flung transmission lines, Western Electric has new, more powerful equipment to meet your needs.

Mobile transmitters and receivers are built to stand up under the hardest service conditions. They're made by the manufacturers of Bell Telephones—backed by years of experience in meeting the varied radio telephone requirements of airlines, police, ships-at-sea, and broadcasting stations.

Get full details on this new equipment from Graybar Electric Co., Graybar Bldg., New York City.

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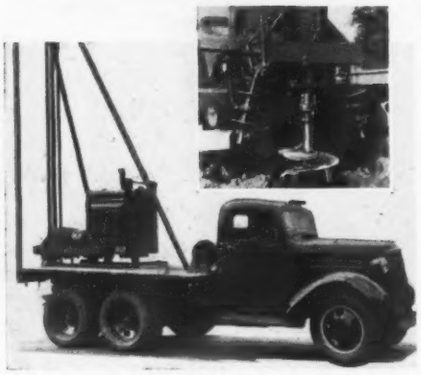
Western Electric
RADIO TELEPHONE EQUIPMENT

Check These 8 Cost-Cutting Features of



Close-up of drilling mechanism, and truck mounted unit with pole setting derrick in place.

BUDA-HUBRON
Pole Hole Drills

1. Fast-efficient—drills holes 24 in. in diam., 6 ft. deep in 3 minutes—20 ft. deep in 20 minutes.
2. Low first cost.
3. Low Operating Cost
4. Economical on replacement work as well as new pole line construction.
5. Low maintenance cost—(the total cost of all individual parts is only 10% greater than cost of complete machine).
6. Drills in shale, hardpan, clay, frozen ground, etc.
7. Installed on standard 1½ ton truck in few hours time.
8. Drills holes to 42 in. in diam., and up to 50 ft. deep.

Let us show you how to save money with Buda-Hubron Pole Hole Drills.

Write for Bulletin 868-W

Cash in on R.E.A. Work—Rent a Buda-Hubron Earth Drill—Write for details of rental program.

BUDA JACKS

The Buda Company has been building quality Jacks for over 30 years, and has available a wide range of sizes of cable reel, pole pulling, automatic lowering, hydraulic, journal and screw Jacks, in capacities from 1½ to 100 tons.

Write for Jack Bulletin No. 950-W.

THE BUDA CO.
ESTABLISHED 1881
HARVEY (CHICAGO SUBURB) ILLINOIS

Letters to the Editor

Electrical Fire Losses

To the Editor of ELECTRICAL WORLD:

An editorial in the March 25 issue of ELECTRICAL WORLD stated that electricity is the "No. 1" fire hazard, and that it accounts for some 16.3 per cent of the annual fire loss. These statements do not agree with other and more extensive data and appear to be questionable as a measure of this source of fire losses.

In the first place, there is an actual misstatement of fact in the editorial. The fire loss for the twelve states is not $270,000,000, as stated, but is given by Mr. Nolting as $64,376,797 average for two consecutive years, or about 24 per cent of the stated figure. The rest of the figures in this paragraph are apparently proportionately in error. In the second place, the electrical loss as stated is not 16.3 per cent of the total, but is actually 9.9 per cent; it is, however, 15.7 per cent (not 16.3 per cent) of the total of known causes.

Mr. Nolting's articles in the *NFPA Quarterly* are based upon fire marshals' reports from twelve states for the two consecutive years 1936 and 1937. Mr. Nolting's own estimate of the validity of this data may be had from a perusal of his original articles. Meanwhile, the analysis of causes formerly prepared by the National Board of Fire Underwriters is available for comparison. For the same twelve states included in Mr. Nolting's article and for the ten years 1923 to 1932 inclusive the figure for electrical fire loss may be compared as follows:

	Total Loss	Attributed to Electricity	Per Cent
10-year average. 1923-1932 (National Board Fire Underwriters)	$115,522,971	$4,698,419	4.06
2-year average.. 1936 and 1937 (Nolting)	64,376,797	6,393,239	9.95

It appears to be improbable that the electrical fire loss more than doubled in proportion to the total loss after an interval of but three years.

There are available, however, much more reliable figures than any of these, although on a somewhat smaller scale, For some years past records have been kept for about 14,500,000 of population of all fires attributed to electricity and of the losses due to authenticated electrical causes. These records have been derived from municipal, fire insurance and utility sources and, since they are investigated cases, are much more dependable than any of the foregoing data. One of the significant results of these studies is the surprisingly large number of fires, originally attributed to electricity, which were found upon investigation not to be due to this cause. Of the actual fires due to electricity, statistics comparable to those given above are as follows:

Investigated Electrical Fires

	Total Loss	Electrical Loss	Cent Per
5-year average 1931-1935 incl.....	$26,794,025	$488,723	1.83

From these data there appears to be no reliable basis for characterizing electricity as the "No. 1 Fire Loss" and, instead of being 16 per cent of the total fire loss, it appears to be probable that it is more like 2 per cent, or less.

ALEXANDER MAXWELL,
Director of Engineering
Edison Electric Institute,
New York, N. Y.

[Our correspondent is correct in saying that the figure of 270 millions is not for the twelve states, as was erroneously stated. It is Mr. Nolting's estimate for the United States. The percentage of 16.3, however, is correct as the ratio of electrical fire losses to the 1937 total fire loss from known causes. The figure of 15.7 per cent relates to the average for two years, which data are not given in the latest report, but must be compiled from the October, 1937, quarterly as well as the one last fall.

However, our correspondent makes the common error of comparing electrical fire losses to total without first subtracting those of unknown origin. Because their origin is unknown, one can give them no different percentage of cause than fires of known cause.

On that basis fires from electrical causes were responsible for 16.3 per cent of the loss in 1937 and 15.7 per cent average for 1936 and 1937. In both years electricity headed the list of fire losses. There may be other sources of data, but to quote Mr. Nolting, a member of the N.F.P.A. Department of Fire Record: "These fire experience figures . . . . are the most reliable data available."—EDITORS.]

•

Senior Quiz Suggestion

To the Editor of ELECTRICAL WORLD:

I have just read Prof. A. D. Moore's letter in the April 22 issue of the ELECTRICAL WORLD concerning quizzes for electrical engineering graduates. I am in thorough accord with Professor Moore's suggestion concerning a quiz covering the general status of the electrical industry. I would be greatly pleased to receive copies of such a quiz for use with my seniors in case you feel that the suggestion is worth while and if you desire to prepare such a quiz.

M. C. HUGHES, Head
Dept. of Electrical Engineering,
Agricultural and Mechanical College
of Texas, College Station

Wants Disclosure of "Anticipator" Details

To the Editor of ELECTRICAL WORLD:

I have read with great interest the article on page 40 of the March 25 issue of ELECTRICAL WORLD by Charles I. Maust, Public Service Electric & Gas Company, Newark, N. J., describing an "Automatic Pipe Anticipator" for use with excavating machinery. This article gives an excellent description of what can be accomplished with this device and how it can be used, but it does not give any information on how the device is constructed.

I would be very much interested in seeing you publish further information on this "Pipe Anticipator," giving more details on its construction, and also complete internal wiring diagram.

E. E. GEHLERT,
Electrical Contractor,
Menomonee Falls, Wis.

•

Fluorescent Lighting

To the Editor of ELECTRICAL WORLD:

Mr. Tuck's letter to the editor which appeared in the June 3 issue calls for a reply. In determining the annual operating expense of a lighting system there are three major items to be considered—fixed charges, power cost and lamp replacement. Mr. Tuck has included the initial lamp installation as part of the fixture cost, whereas it should come under lamp renewals. Moreover, his estimated fixture cost is high.

Since Mr. Tuck's article was written, the light output of the lamps has been increased, as well as the life, so that the entire picture has changed.

Under average conditions, we would expect a fluorescent general lighting installation to cost more than an incandescent installation producing comparable illumination. Correcting Mr. Tuck's figures to conform with present conditions, we find that there is a small saving in annual operating expense through using fluorescent lamps. In addition, there is the advantage of approximately one-fourth the radiant heat and better quality of light.

When the comparison is made on a daylight basis, the fluorescent lamp provides more economical lighting than the filament type lamp.

Actually, the Mazda lamp manufacturers are not promoting the fluorescent lamp as a money saver, but as a new streamlined source of light, producing light of good color quality.

C. S. WOODSIDE,
Commercial Engineering Dept.,
Westinghouse Lamp Division,
Bloomfield, N. J.

OLIVER
Pole Line Material
PERFECTED PRODUCTS OF OVER FORTY YEARS OF ENGINEERING AND RESEARCH
ARMORED AGAINST the ELEMENTS!
Protected by a double thick coat of zinc, bonded securely to a strong steel body by the special Oliver Double Dip Hot Galvanizing Process, Oliver Pole Line Materials are provided with the greatest resistance to rust and weather deterioration — an outstanding quality that has made Oliver a standard specification for many years.
ESTABLISHED 1863
OLIVER IRON AND STEEL CORPORATION
PITTSBURGH PENNA.
OLIVER POLE LINE MATERIALS
APPROVED AND ACCEPTED SINCE 1894
OLIVER

TINNED SPLICING SLEEVES

(split connector)

High tensile strength—when properly soldered wire will break before loosening in sleeve. Tests show no tendency to overheat. Use on either round or sector-shaped cable. All surfaces smoothly tinned. Send for bulletin No. 20.

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SHERMAN

SPLICING SLEEVES

- *Offer True Economy*
- *Uniform High Quality*
- *Three Types Cover all Needs*

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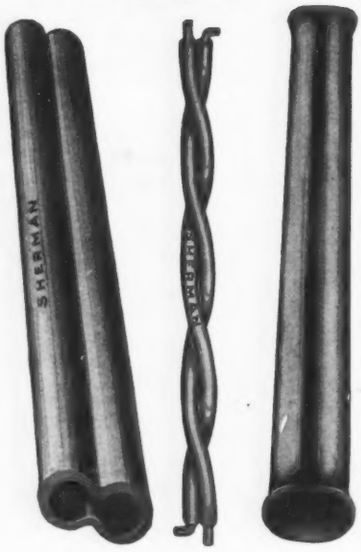

Figure Eight Double Tube

Best quality electrolytic copper insures high conductivity. Seamless and free from burrs. Correctly tempered. Send for Bulletin No. 20.

Oval Single Tube

Free from burrs and of proper temper. Carefully grooved throughout length to prevent buckling outward when twisted. Manufactured in accordance with specifications suggested by N. E. L. A. Committee. Send for Bulletin No. 20.

Sold thru Jobbers

H. B. SHERMAN MFG. CO.

BATTLE CREEK MICHIGAN

War Emergency Power From Present Systems

[*Continued from page 45*]

operation with the attendant increased power transmitted during emergencies is not out of the question.

Insulation Margins Available

Lightning does not recognize lines of different operating voltages. It strikes just as hard on a 2,300-volt rural line as on a 230-kv. trunk transmission line. Many existing lines are therefore over-insulated as far as normal voltage stresses are concerned in order to give high reliability during lightning storms. It will therefore be found that some 66-kv. lines can be operated at 110 kv. As the power transmitted over a given line increases roughly as the square of the operating voltage, it can be seen that provision to operate the lines at higher voltage during emergency will greatly increase the transmission line capacities.

The reduction in fault clearing times from seconds to cycles increases enormously the amount of power that can be transmitted. Through the use of high-speed relays and circuit breakers which reduce the total fault clearing time from one second to eight cycles it is possible to increase the power limit, depending upon the system, to as much as three times. A further gain attained by faster fault clearing is the confinement of the fault to one of a less severe type involving fewer phases.

Lines in Restricted Areas

The bottlenecks of existing substations and underground cable feeds to load centers can be by-passed in many cases by running the high-voltage lines down city streets or through parks and thus to establish simple step-down equipment right at the new load centers for the duration of the emergency. Self-preservation is instinctive in all forms of life, so that if this country were faced with a real emergency the people of Chicago would probably approve a line through Jackson Park or down Michigan Boulevard just as enthusiastically as they would oppose such a proposal today. Furthermore, a detailed study of each substation location will frequently indicate minor limitations that can be cleared away and permit increased capacity to be obtained by such means as adding blowers to existing transformer banks and round-

POLIFE

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Six years on 420 poles that were 99% termite infested at the start.

In ten days all termites were dead and the poles are still 100% clean six years after treatment.

In addition, crown rot has disappeared and the wood is more firm.

Chemicals remaining indicate the treatment good for more than ten years.

Chemical cost 50¢ per 35 ft. pole or 5¢ per year of life extension. Installation by regular line crews 10¢ to 15¢ per pole.

SANDERS–DURLING ENTOMOLOGICAL SERVICE

Guardian Life Building
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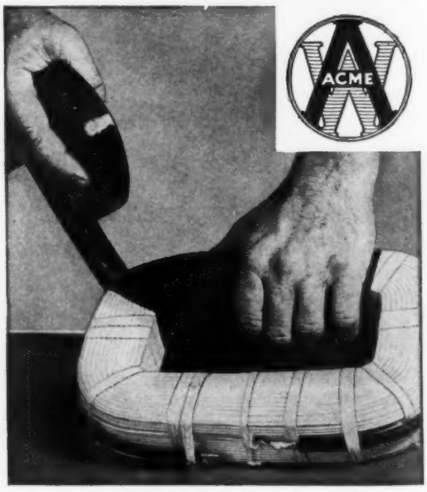


Bias Tapes with

PLENTY OF STRETCH!

THEY fit snugly into all corners and crevices. Their exceptional flexibility and tensile strength are due to an Acme developed process of applying pure vegetable oil varnishes of Acme formula to highest grade cotton fabrics. Offered in bias or straight tapes, and in rolls up to 36″ wide —yellow or black. Samples if requested.

The Acme Wire Co., New Haven, Conn.

Acme Wire Products

VARNISHED INSULATIONS — MAGNET WIRE COILS — CAPACITORS

ing out spare transformer units into complete banks.

When operating in the foregoing manner there is, of course, very essential load in some industries such as cement, steel, chemical and textile mills, etc., that cannot stand even short interruptions without damage. Most of these can be taken care of by emergency feed from nearby stations, but, if necessary, portable power plants to supply only the small percentage of essential load can be put in, which, under normal conditions, would not be considered, for obvious commercial reasons.

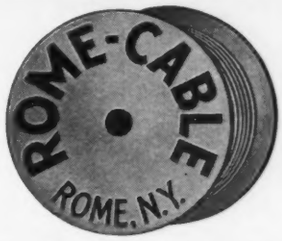
Specify Permissible Noise for Power Transformers

[*Continued from page 50*]

turers will be willing to lower their guarantees as additional experience with noise in transformers is obtained. At the present time, therefore, in order to eliminate the possibility of an additional charge for quietness, the Detroit Edison Company specifies the values given by the solid curve, but states clearly, as in the first paragraph of the excerpts from the specification, that lower measured values are expected.

An indication of the values to be expected from modern transformers is given by the results of noise measurement on 23 standard transformers recently purchased from one manufacturer. Since no special design nor manufacturing procedure was employed to insure quietness, results as good as these should be obtainable on all modern transformers of these ratings. The average sound level for each transformer against kva. rating is given by the plotted line in Fig. 2. These transformers were all self-cooled units with individual cooling tubes welded to the tank and were rated 24,000/5,040 volts at 60 cycles. As indicated in the figure, many of the transformers measured well below the preferred limits, some as much as 4 or 5 decibels lower.

As stated earlier in this article, it is felt that for most installations on the Detroit Edison Company's system standard transformers can be secured which will give satisfactory service from the noise standpoint. To be sure that such units are obtained, however, it is desirable to purchase all transformers for distribution substation service according to noise specifications. Moreover, acceptance



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testing for noise with sound level meters is entirely practicable and should be used whenever transformer noise is an important consideration.

Excerpts from Detroit Edison Company's Specification for Transformer Noise

When energized at normal voltage and frequency and at no load the average sound level of the transformer shall not exceed — decibels. Since experience shows that transformers of normal design are usually quieter than indicated by this figure, only those units having noise levels several decibels below this value will be considered entirely satisfactory.

Instrument Standards—A sound level meter in accordance with ASA Standards Z24.3-1936 shall be used. The noise measurements shall be made using a frequency response curve identified in the standards as Curve A for a 40-db sound level.

Characteristics of Ambient Locality—The characteristics of the ambient locality in which the transformer is placed while noise measurements are being made shall be such that the increase in the measured sound level produced by reflection from surrounding surfaces is small. The microphone locations shall be free from air currents, electrostatic fields, magnetic fields, vibrations or other influences which are known to affect the accuracy of the instrument used. The average ambient sound level shall be at least 7 db below the average sound level of the transformer plus the ambient noise, both determined in the manner specified later. No readings shall be taken when extraneous noises such as those caused by the operation of cranes, hoists, machine tools, air hammers, air compressors or motor vehicle traffic are detectable by the sound level meter.

These conditions may be met by placing the transformer in a special aphonic (quiet) room, the floors, walls and ceiling of which have been covered with sound-absorbing material which is efficient for low frequency notes, 100 to 1,000 cycles per second. In general, however, all the above conditions can be met with the transformer mounted on a concrete floor in any large, quiet room, provided there is no major acoustically reflective surface, other than the floor, within 10 feet of any major sound-producing surface of the transformer.

Although it is not usually necessary, the transformer may be placed on a resilient mounting during the test, in order to eliminate additional noise due to floor vibration.

Microphone Positions—As a general rule, a number of microphone positions shall be chosen so as to obtain the average sound level of the noise at specified elevations in all directions from the transformer, one foot from the major sound-producing surfaces. For transformers having a tank height, exclusive of trucks, base and cover, of less than 8 feet, measurements at only one elevation, at ½ the tank height, are sufficient. For transformers having a tank height of 8 feet or more, measurements shall be made at two elevations, one at 1/3 the tank height and the other at 2/3 the tank height. The microphone

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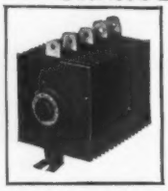

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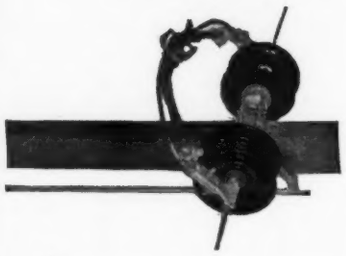

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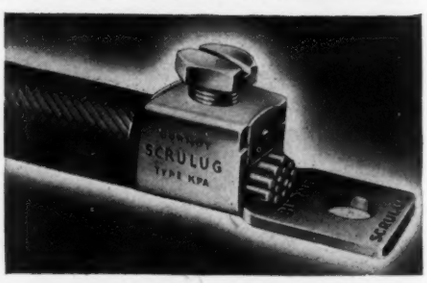

SCRULUG

positions selected shall completely encircle the transformer and shall be approximately uniformly spaced. The distance between adjacent positions shall not exceed 3 feet and at least eight positions shall be used for each elevation.

Technique of Measurement—(a) With the transformer de-energized, readings on the sound level meter shall be made one foot from the transformer for at least four uniformly distributed positions for each elevation to determine the ambient sound level.

(b) Immediately thereafter, with the transformer operating at no load, but energized at normal voltage and frequency from either the primary or secondary winding, a reading on the sound level meter shall be taken for each of the microphone positions chosen.

(c) Immediately after the test of Section b, the average ambient sound level shall again be determined as in Section (a).

(d) If either of the averages of the measurements obtained as directed in Section (a) or (c) is not as much as 7 decibels lower than the average obtained from the measurements outlined in Section (b) the test must be repeated under quieter ambient conditions. If both averages of ambient sound level are 7 decibels or more lower than the average of Section (b), subtract the mean of these two averages from the average of Section (b). This difference determines the correction to be subtracted from the result obtained in Section (b) as follows:

Difference in db	7	8	9	10	Over 10
Correction in db (subtract)	1.0	0.8	0.6	0.4	0.0

This corrected result, which is the average sound level of the transformer alone, shall not exceed the limits specified for the particular transformer being purchased.

Uncle George's Influence Wanes

[*Continued from page 54*]

excuses as the monetary bill, the neutrality situation and the necessity for looking out for the interests of their farmer constituents in the agricultural bill.

But the House members didn't like it at all. They are very jealous of the Senate anyhow, though most of them would like to be senators. And there is no more sure-fire appeal than one to the pride of the House as against the Senate. Moreover, there is a new generation that knows not Joseph in the House. Almost none is left who served with Norris when he was battling against Uncle Joe Cannon. To many of the newcomers he is just a tiresome tradition.

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Municipal Plants

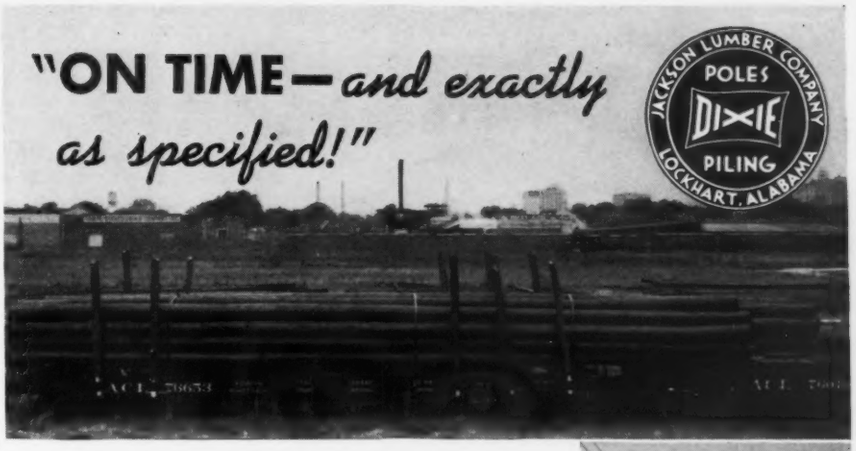
NEW BRITAIN, CONN.—Mayor George J. Coyle has contracted with Burns & McDonnell, engineers, to make a survey of the city to determine the economic feasibility of building a municipally owned and operated electric power plant and distribution system.

COLUMBUS, NEB.—The State Supreme Court has denied a rehearing to the city in the case in which it had previously held void an election on a proposition that the city should construct, purchase or otherwise acquire an electric light and power distribution system.

WEATHERFORD, TEX.—Proceeds from the sale of $350,000 revenue bonds have been received and construction of a municipal electric light and power plant will be started as soon as plans and specifications are completed, Mayor Conrad F. Russell has announced. Construction of the plant will be financed entirely through the sale of revenue bonds and without assistance from a governmental agency. The bonds and interest will be paid out of net revenues from the plant and taxes will not be levied to pay either bonds or interest, Mayor Russell said.

TEXARKANA, TEX.—U. S. Fifth Circuit Court of Appeals has ruled that construction of an electric lighting plant by the city under a $435,000 PWA loan and grant would not violate or invade rights of the Southwestern Gas & Electric Co., which now serves the city under a non-exclusive franchise. The appellate court ruling at New Orleans affirmed a Texas district court which, in overruling the utility company's contentions, held the city was not delegating its legislative power to the PWA, that it had conformed with PWA regulations and that the contemplated competition with the utility company under which the latter would suffer impairment of value of its investment was not sufficient for standing of the issue in court.

ADAMS, WIS.—State Supreme Court upheld the right of the city to acquire electric utility property for $30,000 and denied the village of CAMBRIDGE the right to acquire similar utility property for $25,000. Both cases were appeals of the Wisconsin Power & Light Co. from rulings of Circuit Judge A. C. Hoppmann upholding orders of the state public service commission. The court's order in the Adams case was the result of the commission's neglect to specify that its order fixed the value of the plant as of June 24, 1930, the date the city voted to acquire the property. In the Edgerton acquisition case, decided in March of this year, the court ruled that the commission must fix the price as of the date it makes its final order.



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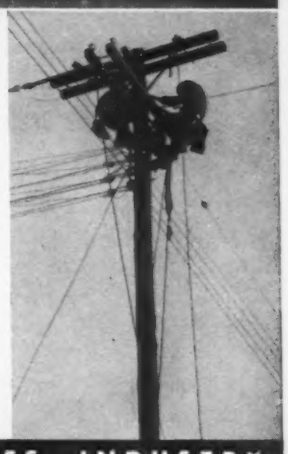

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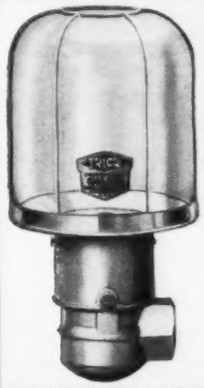

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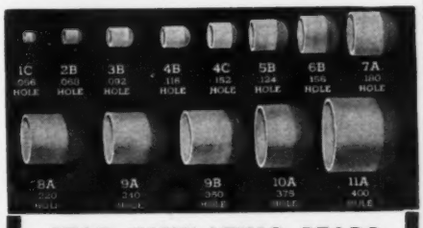

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Sales Opportunities

CENTERVILLE, CONN.—United Illuminating Co., New Haven, Conn., plans new indoor type power substation on Whitney Avenue, Centerville, 36 x 52 feet. Work is scheduled to begin soon.

CLEARFIELD, PA.—Board of County Trustees, Clearfield, has plans under way for new power plant at local Clearfield County Home. Bids will be asked at early date. Russell G. Howard, Deposit National Bank Building, DuBois, Pa., is architect.

KEMMERER, WYO.—Lincoln Service Corp., Frontier, Wyo., R. M. Turner, president, plans extensions and improvements in electric power plant at Kemmerer, including installation of new generator unit and accessories, condenser, switchboard, lightning arrestors and miscellaneous equipment. Cost reported about $150,000. Company also will make extensions in transmission and distributing lines in this area.

LONG BEACH, CALIF.—Northrop Aircraft, Inc., Long Beach, plans installation of motors and controls, regulators, transformers and power substation apparatus, conveyors, electric hoists and other equipment in new aircraft-manufacturing plant on tract of about 20 acres of land, near local airport. Cost about $475,000, of which approximately $250,000 will be used for purchase of tools and operating equipment. Financing is being arranged through sale of stock issued. Proposed to begin work soon.

FREMONT, NEB.—Board of Public Works, J. R. Henry, chairman, has rejected bids received recently for extensions and improvements in municipal electric power plant, including installation of additional equipment, and will take new bids at early date. Cost estimated about $280,000. Black & Veatch, 4706 Broadway, Kansas City, Mo., are consulting engineers.

CLARKESVILLE, TENN.—Cumberland Electric Membership Corp., Clarkesville, plans new three-phase, 11,960-volt transmission line over Cumberland River in vicinity of Government Lock B, for connection with power substation for service for distribution system. Application for permission has been made.

DENVER, COLO.—Bureau of Reclamation, Denver, receives bids until July 21 for main electric control equipment, excitation cubicles with voltage regulators, metalclad switchgear, station-power control equipment, instrument transformers and accessory apparatus, for installation in Elephant Butte hydro-electric power plant, Rio Grande project, New Mexico-Texas. All equipment will be installed by government (Specifications 859).

SYRACUSE, N. Y.—Crucible Steel Co. of America, Inc., 405 Lexington Avenue, New York, N. Y., plans installation of motors and controls, conveyors, regulators, electric hoists and other equipment in connection with expansion and improvements at mills at Syracuse, comprising plants of Halcomb Steel Co., State Fair Boulevard, and Sanderson Brothers Steel Co., Emerson Avenue. Plans have been approved and work will proceed at once. Cost reported close to $900,000.

SCHOHARIE, N. Y.—New York Power & Light Corp., Albany, N. Y., has authorized immediate construction of new transmission line from Schenectady to Schoharie, about 20 miles. Work will be carried out by company forces.

CEDAR, MINN.—Harry Edmunds, Cedar (Anoka County) is at head of new electric cooperative association, now being organized, which plans construction of a steam-electric generating station in vicinity of Cedar, for service for number of rural electric organizations in that district. Cost estimated close to $500,000, including transmission lines. Financing in that amount is being concluded through Federal aid.

ELLENSBURG, WASH.—Kittitas County Utility District, Ellensburg, Roland Kuhn, secretary, has plans maturing for primary and secondary lines in part of county, totaling about 125 miles, with power substations and service facilities. Cost about $150,000. Financing has been arranged through Federal aid.

CIRCLEVILLE, OHIO—Container Corp. of America, Inc., plans new power plant at local box and container paper board mill. Proposed to begin work by close of July. Main offices of company are at 111 West Washington Street, Chicago, Ill.

CUT BANK, MONT.—Huber-Montana Co., Borger, Tex., recently organized by J. M. Huber, Inc., Borger, manufacturer of carbon black, printing inks, etc. as a subsidiary interest, plans installation of motors and controls, air compressors, pumping equipment, conveyors and other equipment in new carbon black plant at Cut Bank, where site has been acquired. A power house will be built. Cost estimated close to $500,000.

BALTIMORE, MD.—Consolidated Gas, Electric Light & Power Co. has approved plans for power substation at 2821 Clare Street, and will proceed with work soon.

CLAYTON, MO.—A. Y. Taylor & Co., Central Building, Clayton (St. Louis), consulting engineers, have plans under way for power substations in conjunction with new electrical distribution systems of the Cooper-Moniteau Electric Cooperative, Inc., California, Mo., and White River Valley Electric Cooperative, Inc., Hollister, Mo. Both projects will represent a total investment of about $500,000, including lines, substations, service facilities, etc. Proposed to begin work this summer.

VOLGA, S. D.—City Council is considering a municipal electric power plant. Estimates of cost are being made. Charles Lee, Mayor, is at head of project.

WASHINGTON, D. C.—Bureau of Yards and Docks, Navy Department, Washington, plans installation of complete electrical equipment and facilities in new utility and transportation building, and laboratory building at Mare Island, Calif., navy yard, to cost $100,000 and $120,000, respectively. Appropriations have been authorized.

MCGREGOR, IOWA—Town Council has authorized surveys and estimates of cost for new municipal electric power plant, and has engaged Young & Stanley, Inc., Muscatine, Iowa, consulting engineer, to proceed with this work at once. Financing will be arranged following engineer's report.

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Correction

E. L. Hansen, assistant in agricultural engineering, University of Illinois, states that he "did not urge farmers to buy 110-volt controllers," as stated in ELECTRICAL WORLD, June 24, but "merely mentioned that farmers in this state can play safe by purchasing controllers for 110-volt current which are approved for Wisconsin."

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(a) Chief Electrical Engineer.
(b) Assistant Chief Electrical Engineer.

Chief Electrical Engineer. Candidates must have high academic qualifications in electrical engineering and practical experience in initiating and working large thermo-electric projects, and should be fully qualified to undertake the construction and operation of such a project on a large scale. The selected candidate will be required to work out details of the project, with estimates, etc., for the electrification of the Province of Bihar and will be responsible for putting the scheme into operation.

Pay will be determined according to qualifications, but will not exceed Rs. 3500 a calendar month (Rupee = 35c. approx.).

Assistant Chief Electrical Engineer. Candidates must possess theoretical and practical knowledge of the working of large thermo-electric projects. Pay will be determined according to qualifications but will not exceed Rs. 1500 a calendar month.

Agreement in both cases for three or five years at the discretion of Government. Free 1st class passages to India for an appointee of non-Asiatic domicile and, if married, for his wife and minor children, and similar return passages on satisfactory termination of agreement.

Further particulars and forms of application may be obtained, on request by postcard, from the India Government Trade Commissioner, 630 Fifth Avenue, New York.

Last date for receipt in England of completed applications 19th August 1939.

EMPLOYMENT SERVICE

SALARIED POSITIONS, $2,500 to $25,000. This thoroughly organized advertising service of 29 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details. R. W. Bixby, Inc., 262 Delward Bldg, Buffalo, N. Y.

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